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PHYCOLOGIA BRITANNICA:

OR,

A HISTORY OF BRITISH SEA-WEEDS,

CONTAINING

COLOURED FIGURES, GENERIC AND SPECIFIC CHARACTERS,
SYNONYMES, AND DESCRIPTIONS

OF

ALL THE SPECIES OF ALGÆ INHABITING THE SHORES OF THE

BRITISH ISLANDS.

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IN FOUR VOLUMES.

VOL. III.

RHODOSPERMEÆ, OR RED SEA-WEEDS:

PART II.

(*Cryptonemiaceæ* and *Ceramiaceæ*.)

SYNOPSIS, No. 190 to 279.

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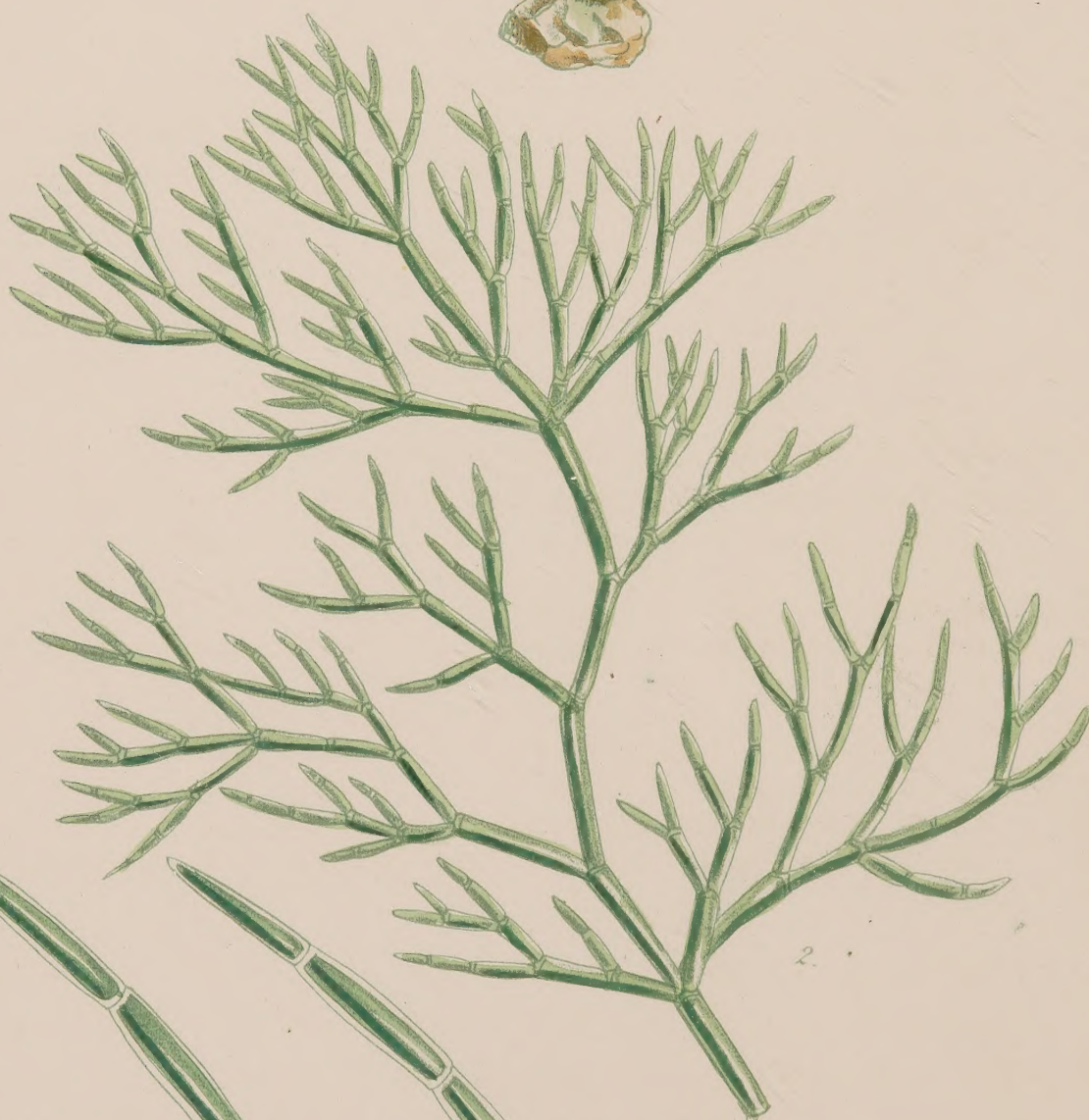


PLATE CXC.

CLADOPHORA LÆTEVIRENS, *Kütz.*

GEN. CHAR. *Filaments* green, jointed, attached, uniform, branched. *Fruit* aggregated granules or zoospores, contained in the joints, having, at some period, a proper ciliary motion. CLADOPHORA (*Kütz.*),—from κλαδος, a *branch*, and φέρω, to bear.

CLADOPHORA *lætevirens*; filaments much branched, bushy, forming tufts of a transparent, yellow-green colour, faded, and without gloss when dry; branches erecto-patent, crowded, repeatedly divided, flexuous, the lesser divisions often opposite; ultimate ramuli secund, blunt, of few articulations; articulations of the branches six times, of the ramuli thrice, as long as broad.

CLADOPHORA *lætevirens*, *Kütz. Phyc. Gen.* p. 267.

CLADOPHORA *ægæa*, *Kütz. Phyc. Gen.* p. 266 (?)

CONFERVA *lætevirens*, *Dillw. Conf. t.* 48. *E. Bot. t.* 1854. *Harv. Man.* p. 137. *Lyngb. Hyd. Dan.* p. 154. *Ag. Syst.* p. 107. *Harv. in Hook. Br. Fl. Hib.* part 3. p. 228. *Wyatt, Alg. Danm.* no. 143.

CONFERVA *glomerata*, *β. marina*, *Roth. Cat. Bot.* vol. iii. p. 237. *Lyngb. Hyd. Dan.* p. 154. *Ag. Syst.* p. 107. *Harv. in Hook. Br. Fl.* vol. ii. p. 357. *Harv. in Mack. Fl. Hib.* part 3. p. 228. *Wyatt, Alg. Danm.* no. 143.

HAB. On rocks, stones, and Algæ, between tide marks. Annual. Summer. Frequent on most of our rocky shores.

GEOGR. DISTR. Atlantic shores of Europe and North America.

DESCR. *Root* scutate. *Filaments* as thick as human hair, or somewhat more robust, 6–8 inches long, densely tufted, and very much branched; the main divisions somewhat zigzag, the lesser branches patent, spreading on all sides, unequal in length, set with two or more series of smaller branchlets, the last of which are frequently opposite. Ultimate *ramuli* one or two lines long, composed of three or four cells, somewhat curved, secund, obtuse, spreading. *Articulations* of the main divisions and larger branches several times longer than broad, of the ramuli about thrice as long, full of a bright endochrome, which is unequally dispersed when the plant is placed in fresh water. *Colour* a fine yellow-green, more or less discharged in drying. *Substance* membranaceous, soft, adhering, but not very firmly, to paper.

A common species on most of our rocky shores, and widely dispersed through the northern Atlantic. Forms nearly resembling it, though they may appear under different specific names, are found in most parts of the world, within temperate latitudes. It was first proposed as a distinct species by Dillwyn, who draws attention to its peculiarly pale green colour and bushy mode of

growth. These characters, taken in addition to the robust threads, spreading branches, and blunt ramuli may serve to distinguish it from our other marine kinds, but it is more difficult to point out characters by which it may be known from a fresh-water species, *C. glomerata*. Almost all authors, indeed, who have written on the genus seem disposed to regard *C. lætevirens* as a marine variety of *C. glomerata*, attributing what minor differences may be seen to a difference of locality. This is the view taken by Agardh, and adopted in Hooker's British Flora. Mrs. Griffiths, however, who has paid much attention to plants of this genus, and to whose acute eye we owe the detection of more than one new form among them, is of a different opinion, and, at her instance, I have in another place restored *C. lætevirens* to the catalogue: whilst I express my doubts of the propriety of such a step. Among such imperfect plants *habitat* may, perhaps, be admitted as a character of no ordinary importance, and if we allow it in the present case, there can be no difficulty in the matter; for *C. lætevirens* is found in the open sea, beyond all influence of fresh water, and *C. glomerata* in rills and rivers remote from the sea, and often high among the hills. Practically, therefore, and as far as *collectors* are concerned, the plants may be allowed to be distinct. But when we come to speak of the physical distribution of species, it should be borne in mind that these marine and fresh-water plants are, perhaps, different states of the same thing. A similar instance of an Alga growing in the open sea and in fresh water, occurs in *Bangia fusco purpurea*, which is often found in fresh-water streams in very inland situations; but instances of such indifference in *habitat* are very unusual.

Fig. 1. CLADOPHORA LÆTEVIRENS:—*of the natural size*. 2. Part of a branch.
3. Ramuli:—*more or less highly magnified*.



PLATE CXCI.

PTILOTA SERICEA, *Gmel. (sp.)*

GEN. CHAR. *Fronde* inarticulate, linear, compressed, or flat, distichous, pectinato-pinnate; the pinnules sometimes articulate. *Fructification*, of two kinds on distinct individuals; 1, *tetraspores* attached to, or immersed in, the ultimate pinnules; 2, roundish, clustered *receptacles* (*favellæ*) surrounded by an involucre of short ramuli. Ptilota (*Ag.*),—from *πτίλωτος*, *pinnated*.

PTILOTA *sericea*; frond flaccid, excessively branched; secondary branches bi-tripinnate; pinnæ and pinnules exactly opposite, the latter linear, composed of a single row of cells; tetraspores on short processes of the pinnules; favellæ pedunculate, binate, naked, or surrounded with a few irregular ramuli.

PTILOTA *elegans*, *Kütz. Phyc. Gen.* p. 378.

PTILOTA *plumosa*, var. *γ. tenuissima*, *Ag. Sp. Alg.* vol. i. p. 386. *Ag. Syst.* p. 195.

PTILOTA *plumosa*, *β. capillaris*, *Grev. Alg. Brit.* p. 155. *Hook. Fl. Br.* vol. ii. p. 307. *Wyatt, Alg. Danm.* no. 77. *Harv. in Mack. Fl. Hib.* part 3. p. 204. *Harv. Man.* p. 84.

FUCUS *sericeus*, *Gm. Hist. Fuc.* p. 149. t. 15. f. 3.

FUCUS *Ptilotus*, *Gunn. Fl. Norv.* vol. ii. p. 135. t. 2. f. 15. *Esper. Ic.* p. 96. t. 46.

FUCUS *pectinatus*, *Gunn. Fl. Norv.* vol. ii. p. 122. t. 2. f. 8. *Esper. Ic.* p. 97. t. 47.

PLOCAMIUM *elegans*, *Bory, sec. Kütz.*

HAB. On the perpendicular faces of rocks, between tide marks; rarely on the stems of *Fucus serratus*. Perennial. Summer and autumn. Very common on the British shores.

GEOGR. DISTR. Atlantic shores of Europe, from Norway to France. East coast of North America.

DESCR. *Root*, a small disk. *Fronde*s tufted, two to four inches long, or more, and as much in expansion, distichous, excessively branched, in a more or less regularly pinnate manner, the main divisions only being somewhat dichotomous; secondary branches elongate, repeatedly and closely pinnate, the pinnæ and pinnulæ nearly horizontally patent, of very irregular lengths, short and long being intermixed consecutively without order; the longer again and again pinnated, the shorter simple. *Ultimate pinnulæ* very closely set, those on the outer side of the pinnæ longer than the inner, linear, blunt, slightly curved, articulated, composed of a single row of quadrate cells; the older ones emitting pinnules of a second order at each joint, in which case the cells of the main pinnule acquire an invertly pyriform shape (owing to the excavation of two lateral buds). *Tetraspores* spherical, with wide borders, borne on the lateral processes of the pinnules. *Favellæ* on

the apices of shortened pinnæ, largish, binate, oval, containing many granules, naked, or surrounded by an imperfectly formed involucre of jointed ramuli. *Colour*, a very dark blackish, or brownish red; becoming pinky, after long exposure and steeping in fresh water. Under the microscope small portions have a clear, full lake colour. *Substance* very soft and flaccid, adhering to paper.

Under Plate LXXX. of the first volume, I stated my intentions to separate the form usually considered by British botanists as a variety of *Ptilota plumosa*, from that species, as has already been done by Kützinger, and I now fulfil that promise. I am compelled, however, in deference to an earlier botanist, to adopt a different specific name from that imposed by Kützinger. That our plant is really the *Fucus sericeus* of Gmelin, as well as the *F. Ptilotus* and *F. pectinatus* of Gunner, admits of scarcely a doubt. The descriptions of these authors are sufficiently full, and the figures quoted sufficiently characteristic. And I much prefer the expressive name *sericeus*, which aptly defines the soft and *silky* substance of this species, to the much more modern *elegans*, which, however applicable in the abstract, is scarcely characteristic of a plant which is probably the least elegant of the beautiful genus to which it belongs. Had I been at liberty to choose a specific name, I should certainly have proposed *rupestris* as the most characteristic.

Under *Pt. plumosa* I have already stated that our *Pt. sericea* “invariably” grows on rocks. This is using rather too strong an expression, for though it very generally does grow on rocks, it is sometimes found on several of the smaller Algæ, and therefore mere difference of habitat cannot be insisted on as one of its diagnostic characters. The true difference between *Pt. plumosa* and *Pt. sericea* must be placed in the different structure of the ramuli, these being much more simple in the present plant. Two other species, with similarly jointed ramuli, are found in the Southern Hemisphere.

Fig. 1. PTILOTA SERICEA:—*of the natural size.* 2. A plumule. 3. Young pinnule. 4. An older pinnule. 5. Part of a fertile pinnule, bearing tetraspores. 6. A tetraspore. 7. Pinnule with favellæ. 8. A favella:—*all more or less magnified.*



PLATE CXCII.

LAMINARIA PHYLLITIS, *Lamour*.

GEN. CHAR. *Frond* stipitate, coriaceous, or membranaceous, flat, undivided, or irregularly cleft, ribless. *Fructification*; cloudy spots of spores, imbedded in the thickened substance of some part of the frond. LAMINARIA (*Lamour*.),—from *lamina*, a thin plate, in allusion to the flat frond.

LAMINARIA *phyllitis*; stipe short, subcompressed, gradually expanding into a linear-lanceolate, delicately membranaceous, undivided frond.

LAMINARIA *phyllitis*, *Lam. Ess.* p. 22. *Lyngb. Hyd. Dan.* p. 23. *Ag. Sp. Alg.* vol. i. p. 121. *Ag. Syst.* p. 273. *Spreng. Syst. Veg.* vol. iv. p. 325. *Grev. Alg. Brit.* p. 34. *Hook. Br. Fl.* vol. ii. p. 272. *Harv. in Mack. Fl. Hib.* part 3. p. 171. *Endl. 3rd Suppl.* p. 27. *Kütz. Phyc. Gen.* p. 345.

LAMINARIA *saccharina* (*young state*), *Hook. Fl. Scot.* part 2. p. 98.

LAMINARIA *saccharina*, var. *attenuata*, *Grev. Fl. Edin.* p. 282.

FUCUS *phyllitis*, *Stack. Ner. Brit.* t. 9. *Turn. Syn.* p. 193. *Turn. Hist.* t. 164. *E. Bot.* t. 1331. *Esper, Ic.* t. 149.

FUCUS *phyllitidis folio*, *Raii. Syn.* p. 40.

HAB. On rocks and stones, in pools left by the tide; also in four or five fathoms water. Biennial? Summer. Not uncommon. Coast of Dorsetshire, *Pulteney*. Portland Head and Tenby, *Stackhouse*. Sidmouth and Torquay, *Mrs. Griffiths*. Yarmouth, *Mr. Wigg*. Coast of Sussex, *Mr. Borrer*. Orkney, *Rev. J. H. Pollexfen* and *Dr. Mc'Bain*. Frith of Forth and Staffa, *Dr. Greville*. Ardrossan, *Rev. D. Landsborough*. Larne, *Mr. Templeton*. Bantry Bay, *Miss Hutchins*. Howth and Balbriggan, *Miss Gower*. Kingstown, *Mr. T. N. Cole*.

GEOGR. DISTR. Atlantic shores of Europe, from Norway to France.

DESCR. *Root* consisting of thick, branching, and clasping fibres. *Stem*, an inch or two in length, slender, cylindrical below, becoming compressed upwards, and gradually widening into the much attenuated base of a linear lanceolate frond. *Frond* from six or eight inches "to three or more feet in length, and one to six inches in width," (*Grev.*) delicately membranaceous, flat, or slightly waved at the margin, undivided, tapering much, and gradually to each extremity. *Fructification*, I have not seen. *Substance* thin, but tough, glossy, and more or less perfectly adhering to paper. The frond is traversed internally by a double stratum of large air-cells, whose walls, as well as the surfaces of the frond, are composed of minute cellules. *Colour*, when quite fresh, a clear, brown-olive, soon changing in fresh water to green, which is also the colour of dried specimens.

This plant has been observed by botanists from a very early period, and almost invariably kept distinct from *L. saccharina*,

its nearest ally, by every author who has written on the subject of Phycology. Dr. Greville, who at one time united it with *L. saccharina*, has, in his last work, restored it to a place in the system, remarking:—"I cannot but express some doubt regarding the claim of this beautiful Alga to be considered as distinct from the preceding species (*L. saccharina*). The more I have studied it in a growing state, the less am I tempted to speak positively on the subject. Upon the whole, however, I am rather inclined to think it a true species. Having traced it from its earliest appearance to its full size, I can testify that its characters are preserved in every stage." I believe that most observers have, at one time or other, shared in the doubts thus expressed by Dr. Greville, and many may be disposed to go further and reject *L. phyllitis* from the list altogether. Among these I must mention Mrs. Griffiths, who has repeatedly stated to me her opinion that no good marks exist between *L. phyllitis* and *saccharina*, but that the former is merely the young of the latter. In adopting a contrary view, I have not acted hastily or without comparing specimens of the young of both plants. Very recently my friend Mr. Cole has laid before me a series of specimens of both, tracing the growth of *L. saccharina* upwards, from the height of half an inch to a full development, and a similar set of young plants of *L. phyllitis*. And I must admit that, though there is a close resemblance, there is a clear distinction at all ages between living plants: *L. saccharina* being thicker, of darker colour, and with a more abrupt base than *L. phyllitis*, whose delicately membranous nature, and strictly lanceolate form, are preserved to a very large size. The latter also very rapidly changes colour in fresh water, while the former may be preserved for some hours in that medium.

Having said so much, I submit the matter to the investigation of my fellow-students, and shall be glad to be favoured with an expression of their opinions.

Fig. 1. LAMINARIA PHYLLITIS; small specimens:—*of the natural size*. 2. Portion of the surface. 3. Section of the frond:—*both highly magnified*.



PLATE CXCIIL.

CERAMIUM DIAPHANUM, *Roth.*

GEN. CHAR. *Frond* filiform, one-tubed, articulated; the dissepiments coated with a stratum of coloured cellules, which sometimes extend over the surface of the articulation. *Fructification* of two kinds on distinct individuals; 1, *tetraspores* either immersed in the ramuli or more or less external; 2, sessile, roundish *receptacles* (*favellæ*), having a pellucid limbus, containing minute, angular spores, and subtended by one or more, short, involucral ramuli. CERAMIUM (*Roth.*),—from *κεραμος*, a *pitcher*; but the fruit is not pitcher-shaped.

CERAMIUM *diaphanum*; filaments setaceous, attenuated upwards, rather flaccid, irregularly dichotomous, the lower forkings distant, the upper close together; branches set with short, lateral, dichotomous ramuli; articulations colourless, those of the main stems three or four times as long as broad, of the ramuli short; dissepiments swollen, opaque; apices hooked inwards; tetraspores whorled in the joints, depressed; favellæ in the ultimate forkings of the branches, or on lateral ramuli, involucrate.

CERAMIUM *diaphanum*, *Roth, Cat. Bot.* vol. iii. p. 154. *Ag. Syn.* p. 61. *Hook. Fl. Scot.* part 2. p. 85. *Ag. Syst.* p. 133. *Ag. Sp. Alg.* vol. ii. p. 150. *Grev. Fl. Edin.* p. 310. *Harv. in Hook. Br. Fl.* vol. ii. p. 336. *Wyatt, Alg. Danm.* no. 87. *Harv. in Mack. Fl. Hib.* part 3. p. 210. *Harv. Man.* p. 99. *J. Ag. Alg. Medit.* p. 81. *Endl. 3rd Suppl.* p. 27.

HORMOCERAS *diaphanum*. *Kg. Phyc. Gen.* p. 378. *Kg. Linn.* xv. p. 733.

CONFERVA *diaphana*, *Lightf. Fl. Scot.* p. 996. *Fl. Dan.* t. 951. *Roth. Fl. Germ.* p. 525, and *Cat.* vol. ii. p. 226. *Dillw. Conf.* t. 38. *E. Bot.* t. 1742. *With.* vol. iv. p. 139.

CONFERVA *nodulosa*, *Huds. Fl. Ang.* p. 600.

BORYNA *diaphana*, *Grat. Dict. Class.* t. 11. *Bory, Morée.* p. 77. no. 1797.

HAB. Parasitical on several of the smaller Algæ in rock-basins, between tide marks; sometimes growing on rocks. Annual. Summer. Not uncommon on the British coasts from Orkney to Cornwall.

GEOGR. DISTR. Dispersed throughout the temperate parts of the Atlantic and Pacific Oceans. (The various localities given require re-examination, as several species are commonly confounded by authors under the name *diaphanum*.) Mediterranean and Black Seas, *Ag.*

DESCR. *Root* minute, discoid. *Fronds*, three to six or eight inches long, not very densely tufted, setaceous at base, gradually attenuated upwards to a capillary fineness, more or less regularly dichotomous, or flabellately branched, sometimes alternately divided with an evident main-stem; the branches naked, or set with slender, forked, or several times dichotomous, short ramuli, one to three lines in length. Apices hooked in. Lower axils distant, spreading; upper gradually closer and more erect. *Articulations*

pellucid, those of the main branches four or five times longer than broad; of the upper branches gradually shorter; of the ramuli exceedingly short; all deeply coloured at the swollen joints. *Tetraspores* immersed in the joint, several in each, disposed in a whorl. *Favellæ* surrounded by an involucre of several (4-5) short incurved ramuli, either sessile in the upper forks or borne on lateral peduncles. *Substance* soft, but rather firm; glossy when dry, and adhering pretty firmly to paper. *Colour*, a brownish-red, with a purplish tinge; sometimes more clearly purple.

Our figure is intended to represent the *typical* form of the old *Conferva diaphana* of British authors, the longest known of the extensive group of the genus to which it belongs; a group which contains numerous very distinct plants, which were once confounded together as varieties of the species now under review. From the British species of this section, except one, our *C. diaphanum* may be at once known by its larger size and more robust filaments; it is also well characterized by the lateral dichotomous ramuli given off all along the principal divisions of the frond, and by the gradually attenuated filaments. These last characters distinguish it from *C. nodosum* and *C. fastigiatum*.

Limited as it now is, the species has a very wide range, being found in most of the temperate parts of the sea. Though existing on all our coasts, from north to south, it does not appear to be very abundant anywhere, seldom growing in society: the tufts being thinly scattered here and there through the rock-pools. When growing, few Algæ are more delicately beautiful; and even in a dry state it forms a very handsome object, the brilliancy and regularity of the dot-like joints, connected by hyaline, glistening spaces, having the effect of a piece of fine tracery.

Fig. 1. CERAMIUM DIAPHANUM:—*of the natural size.* 2. Branch, with tetraspores. 3. Joints from the same. 4. A tetraspore. 5. Branch with favellæ. 6. Joints from the same, with involucreted favellæ:—*all more or less highly magnified.*



PLATE CXCIV.

ASPEROCOCCUS ECHINATUS, *Grev.*

GEN. CHAR. *Frond* unbranched, tubular, cylindrical, or rarely compressed, continuous, membranaceous. *Fructification* scattered over the whole frond, in minute, distinct *dots* (*sori*) composed of roundish, prominent spores, mixed with club-shaped filaments. ASPEROCOCCUS (*Lamour.*), corruptly formed from *asper*, *rough*, and *kokkos*, a *fruit* or *seed*.

ASPEROCOCCUS *echinatus*; frond cylindrical, obtuse, or acute, much and gradually attenuated to the base.

ASPEROCOCCUS *echinatus*, *Grev. Alg. Brit.* p. 50. t. 9. *Harv. Man.* p. 35. *Endl. 3rd Suppl.* p. 26.

ASPEROCOCCUS *fistulosus*, *Hook. Br. Fl.* vol. ii. p. 277. *Wyatt, Alg. Danm.* no. 7. *Harv. in Mack. Fl. Hib.* part 3. p. 175.

ASPEROCOCCUS *rugosus*, *Lamour. Ess.* p. 62.

ENCÆLIUM *echinatum*, *Ag. Sp. Alg.* vol. i. p. 145. *Ag. Syst.* p. 261. *Spreng. Syst. Veg.* vol. iv. p. 328. *Kütz. Phyc. Gen.* p. 336.

ENCÆLIUM *Lyngbyanum*, *Grev. Crypt.* t. 290.

SCYTOSIPHON *fistulosus*, *Lyngb. Hyd. Dan.* p. 66.

SCYTOSIPHON *filum*, var. *fistulosum*, *Ag. Sp.* vol. i. p. 163. *Ag. Syst.* p. 258.

ULVA *fistulosa*, *Huds. Fl. Ang.* p. 569. *E. Bot.* t. 642. *Hook. Fl. Scot.* part 2. p. 92.

CONFERVA *fistula*, *Roth, Cat. Bot.* vol. iii. p. 169.

Var. β . frond setaceous, filiform, twisted.

ASPEROCOCCUS *echinatus*, β . *vermicularis*, *Harv. Man.* p. 35.

ASPEROCOCCUS *vermicularis*, *Moore, Ord. Surv. Londonderry, Bot.* p. 9. *Wyatt, Alg. Danm.* no. 207.

HAB. On stones, &c., between tide marks. Annual. Summer and autumn. Common on the British shores.

GEOGR. DISTR. Atlantic coasts of Europe and America. Southern Ocean, at Lord Auckland's Islands, *Dr. Hooker*.

DESCR. *Root*, a small disc. *Fronds* densely tufted, from twenty to a hundred growing from nearly the same point, varying from two inches to two feet in length, and from half a line to half an inch in diameter, very much and very gradually attenuated at the base, and more or less tapering upwards, sometimes ending abruptly in a blunt point, sometimes acute, and much drawn out, cylindrical, bag-like, here and there irregularly somewhat narrowed, or slightly constricted. *Fructification* densely sprinkled over the whole frond, forming minute, prominent, rough dots, composed of densely packed, vertical filaments, among which the spores are concealed. In a young state the frond is clothed with long, pellucid fibres. *Substance* membranaceous, soft; when young, slimy, adhering to paper. *Structure* reticulated, the membrane composed of large, lax cells. *Colour* olive, more

or less brown ; when young greenish. β . differs in being much more slender, and generally is a parasite on other small Algæ.

A very common, but we cannot say a very beautiful plant ; one of the least highly organized of the family to which it belongs, and the coarsest in its mode of growth. The only variation to which it is subject is the size, and the more or less tapering extremities. The size varies so greatly that very good observers have contended for two species, the smaller one of which we retain as a variety, although it passes so insensibly into the larger form that no distinct limits can be assigned between them. From *A. Turneri* (Pl. XI.) this is at once distinguished by the thicker substance, darker colour, tapering base, and by being only moderately inflated. The former species is also remarkable for the bluntness of its frond. The present more nearly resembles *A. compressus*, (Pl. LXXII.), some ill-coloured and narrow examples of which have very much the outline and general aspect of *A. echinatus*, and can scarcely be known from it except by the character of compression : a character whose distinctness is greatly lost in the dry state.

Other specimens frequently are met with which resemble *Chorda lomentaria*, even to the extent of being here and there constricted. The fructification affords the best mark of distinction from puzzling forms of the latter.

Fig. 1. ASPEROCOCCUS ECHINATUS ; fronds :—*of the natural size*. 2. Portion of the tube, with sori :—*magnified*. 3. Section of the membrane and sorus :—*highly magnified*.



PLATE CXC.V.

POLYSIPHONIA BRODIÆI, Grev.

GEN. CHAR. *Fronde* filamentous, partially or generally articulate; the joints longitudinally striate, composed of numerous radiating cells or tubes disposed round a central cavity. *Fructification* two-fold on different individuals; 1, ovate *capsules* (*ceramidia*) furnished with a terminal pore, and containing a tuft of pear-shaped spores; 2, *tetraspores* imbedded in swollen branchlets. POLYSIPHONIA (Grev.),—from *πολυς*, *many*, and *σιφων*, a *tube*.

POLYSIPHONIA *Brodiaei*; stems inarticulate, robust, cartilaginous, alternately branched; branches virgate, clothed with spreading, pencilled, multifid, delicate, flaccid ramuli; articulations of the ramuli three or four tubed, rather longer than broad; siphons in the stem about seven, surrounding a narrow cavity; capsules ovate, pedicellate, or sessile; tetraspores in the swollen tips of the multifid ramuli.

POLYSIPHONIA *Brodiaei*, Grev.—*Harv. in Hook. Br. Fl.* vol. ii. p. 328. *Harv. in Mack. Fl. Hib.* part 3. p. 206. *Wyatt, Alg. Danm.* no. 83. *Harv. Man.* p. 91. *Endl. 3rd Suppl.* p. 45. *Kütz. Phyc. Gen.* p. 427.

HUTCHINSIA *Brodiaei*, *Lyngb. Hyd. Dan.* p. 109. t. 33. *Hook. Fl. Scot.* part 2. p. 88. *Ag. Syst.* p. 154. *Ag. Sp. Alg.* vol. ii. p. 63.

HUTCHINSIA *penicillata*, *Ag. Sp. Alg.* vol. ii. p. 65.

CONFERVA *Brodiaei*, *Dillw. Conf.* t. 107. *E. Bot.* t. 2589.

CERAMIUM *Brodiaei*, *Ag. Disp.* p. 20.

HAB. On rocks and corallines near low-water mark. Annual. Summer. Common on the rocky shores of Scotland; of the south of England, and south and west of Ireland. Channel Islands.

GEOGR. DISTR. Atlantic shores of Europe, as far south as France; and of North America. Fœroe Islands.

DESCR. *Root* a conical disc. *Fronde*s from six to twelve inches long or more, as thick as small twine at the base, gradually attenuated upwards, generally furnished with a more or less evident main stem divided into several long, simple branches, of a linear-lanceolate outline. Sometimes the branches spring from nearly the same points; at other times they are disposed alternately along a lengthened stem, when the frond assumes a pinnate character. *Branches* long and simple, inarticulate like the stem, quadrifarious, and clothed more or less densely with short, flaccid, and slender quadrifarious ramuli, about half an inch in length. *Ramuli* multifid, irregularly dichotomous, pencilled, articulated. *Articulations* of the ramuli rather longer than broad, marked with three or four tubes; dissepiments hyaline. *Stem* opaque, traversed by about seven primary siphons, surrounded by as many secondary ones, and with a wide stratum of smaller cells. *Capsules* ovate, abundantly produced on the multifid ramuli, mostly pedicellate. *Tetraspores* in swollen ramuli. *Colour* a dark brown, with more or less of a purplish

shade. *Substance* very soft, in some instances gelatinous, and soon decomposing in fresh water. *Smell* very disagreeable.

This is one of the handsomest, as it is one of the largest of the British species of *Polysiphonia*, and easily recognised, except occasionally from some specimens of *P. fruticulosa*, by its peculiar habit. The inarticulate stem, and long, simple, robust branches clothed with pencils of delicate filaments strongly mark the species. Common as it is now ascertained to be on many of our shores, as well as on those of northern Europe and the eastern shores of North America, it remained unnoticed by botanists until it was observed about forty years ago, by the late Mr. Brodie, of Brodie, to whose honour Mr. Dillwyn has dedicated it.

The figure originally given in Dillwyn's *Confervæ* is very characteristic of a common form of the plant; and so also, as it appears to me, is that given by Lyngbye, which latter, nevertheless, is held by the elder Agardh to represent a distinct species, which he calls *P. penicillata*. Except in the greater simplicity of ramification, this last perfectly agrees with the common form; and I confess myself unable to draw any distinct line, even sufficient to mark a *variety*, between it and the plant represented in our plate. It would be easy to find, in the large suite of specimens from which I have had to select, several forms distinguished by minor peculiarities of branching, which nevertheless agree in the aggregate of characters; and if *P. penicillata* be admitted to rank as a species, we must be prepared to divide the species still more; but, I think, to little purpose.

Fig. 1. *POLYSIPHONIA BRODIÆI*:—*of the natural size*. 2. Multifid ramulus, with capsules. 3. Apex of the same, with a capsule. 4. Apex of a ramulus with tetraspores. 5. Transverse section of the stem.



PLATE CXCVI.

CLADOPHORA GLAUDESCENS, *Griff.*

GEN. CHAR. *Filaments* green, jointed, uniform, branched. *Fruit*, aggregated granules or zoospores, contained in the joints, having, at some period, a proper ciliary motion. CLADOPHORA (*Kütz.*), — from κλαδος, a *branch*, and φέρω, to bear.

CLADOPHORA *glaucescens*; tufts dense, glaucous-green, subfastigate; filaments very slender, flexuous, excessively branched; branches rather straight, erect, or erecto-patent, the lesser ones furnished with close, very erect, straight, elongated ramuli; articulations nearly uniform, about thrice as long as broad.

CONFERVA *glaucescens*, *Griff. in Wyatt, Alg. Danm.* no. 195. *Harv. Man.* p. 139.

HAB. On rocks and stones, between tide marks. Annual. Summer. Not uncommon. Torquay, *Mrs. Wyatt*. Falmouth Bay, *Miss Warren*. Mounts Bay, *Mr. Ralfs*. Mangan's Bay, *Miss Ball*. Portmarnock, *Mr. Moore*. Coast of Down, *Mr. W. Thompson*. Rocks beyond Kingstown Harbour, abundant in May, *W. H. H.*

GEOGR. DISTR. British Islands.

DESCR. *Root*, a small callus. *Filaments* very slender, densely tufted, two to four inches long, sometimes forming circumscribed tufts, sometimes more unequally distributed, excessively branched; the principal branches variously curved or irregularly bent, the lesser ones more and more straight and erect, alternate, or secund, very rarely opposite, repeatedly divided. *Ultimate ramuli* usually elongated, consisting of several cells, secund, erect, close together. *Articulations* uniform in all parts of the frond, about thrice as long as broad, filled with a pale green, not very dense endochrome, which is more or less dissipated in drying. *Substance* membranaceous, rather soft, but not flaccid, adhering, but not very closely, to paper in drying. When dry, the colour is sometimes a pale green, sometimes darker; and the filaments preserve a slight gloss.

This is one of the many beautiful plants for whose correct determination the Phycologist is indebted to the accurate eye and discriminating judgment of Mrs. Griffiths, who first published it in Mrs. Wyatt's excellent Fasciculi of Devonshire Algæ. It is difficult to say to which of the British species of *Cladophora* it is most closely allied. At one time I regarded it as belonging to the same group as *C. arcta*, and even thought that it might prove to be merely a state of that species: but a more careful examin-

ation and comparison show a greater affinity with *C. albida* or *C. refracta*, from either of which, however, it is readily known by a difference in ramification. Its peculiarly glaucous colour when fresh, joined to the slenderness of the filaments, and the uniform length of the articulations in all parts of the stem, are characters by which it may most easily be known. To avoid mistakes, I have drawn the magnified portions (fig. 2 and 3) from part of one of the original specimens published in the *Algæ Danmonienses*. It sometimes grows to a much larger size than is represented at fig. 1.

I am not aware that this species has yet been noticed beyond the range of Britain; but the various forms of this puzzling genus are so imperfectly deciphered, that it is quite possible that it may be found under some other name, among the long lists of species published by various Continental authors. But this is a point which can scarcely be settled without a careful comparison of authentic specimens in various states. Meanwhile, I trust the figure and description now given will serve to make the characters of our *C. glaucescens* more generally known to botanists out of England.

Fig. 1. *CLADOPHORA GLAUDESCENS*:—*of the natural size*. 2. Part of a branch.
3. Ramuli:—*more or less highly magnified*.



PLATE CXCVII.

ECTOCARPUS LITORALIS, *Lyngb.*

GEN. CHAR. *Fron*d capillary, jointed, olive or brown, flaccid, single-tubed. *Fruit* either spherical, elliptical, or lanceolate *utricles* (or *spores*) borne on the ramuli, or imbedded in their substance. ECTOCARPUS (*Lyngb.*),—from *εκτος*, *external*, and *καρπος*, *fruit*.

ECTOCARPUS *litoralis*; tufts dense, interwoven, olive-brown or foxy; filaments coarse, much and irregularly branched, the ultimate branchlets patent, alternate, or rarely opposite; masses of fructification imbedded in the substance of the branches, in the form of oblong swellings.

ECTOCARPUS *litoralis*, *Lyngb. Hyd. Dan.* p. 130. t. 42. (excl. var. β .) *Ag. Sp. Alg.* vol. ii. p. 40. *Harv. in Hook. Br. Fl.* vol. ii. p. 325. *Harv. in Mack. Fl. Hib.* part 3. p. 181. *Harv. Man.* p. 40. *Wyatt, Alg. Danm.* no. 129. *Kütz. Phyc. Gen.* p. 289. *Endl. 3rd Suppl.* p. 21.

ECTOCARPUS *compactus*, *Ag. Sp. Alg.* vol. ii. p. 41.

ECTOCARPUS *ferrugineus*, *Ag. Syst.* p. 163. *Ag. Sp. Alg.* vol. ii. p. 43. *Kütz. Phyc. Gen.* p. 289 (?)

CONFERVA *litoralis*, *Linn. Sp. Pl.* p. 1634. *Huds. Fl. Ang.* p. 594. *Lightf. Fl. Scot.* p. 979. *With. Br. Ar.* vol. iv. p. 130. *Roth, Cat. Bot.* vol. i. p. 152. *Dillw. Conf.* t. 31. *E. Bot.* t. 2290.

HAB. Parasitical on *Fuci* and *Laminariæ*, within and beyond the influence of the tide. Annual? At all seasons. Very common on the British shores.

GEOGR. DISTR. Abundant throughout the Northern and Atlantic Oceans.

DESCR. *Filaments* from six to twelve inches long, densely tufted, coarse, excessively branched, and often bundled together and matted into inextricable fascicles. *Branches* spreading, very irregularly inserted, usually alternate or scattered, sometimes, especially the smaller ones, opposite, repeatedly divided, of unequal length and composition. *Ramuli* scattered, or somewhat fascicled, usually alternate, erecto-patent, filiform, slightly tapering. *Articulations* about as long as broad, or a little longer. Masses of *fructification* formed at intervals in the substance of the smaller branches and ramuli, oblong, more or less elongated, consisting of swellings, twice the diameter of the filament, dark-coloured, and transversely striate. *Colour* when young, a greenish olive, becoming more and more brown, and even foxy, or reddish in old age. *Substance* soft, but not gelatinous, closely adhering to paper in drying, and not recovering well on re-immersion.

One of the commonest of the British Algæ, and widely dispersed along the shores of the ocean of most temperate countries, its specific name *litoralis* is peculiarly applicable. Nor is this shore plant at all particular in choosing the substances to which it

adheres, or the depth of water where it vegetates. It equally infests the *Fuci*, which grow between tide-marks, covering with a shaggy brown fleece those that occur near high-water mark, and those that prefer a deeper level; and the *Laminariæ* that are never exposed to the air. It thus extends nearly throughout the whole belt occupied by sea plants. Nor is it confined to open sea shores; it frequents estuaries, and ascends tidal rivers for a considerable distance, growing either on *Fucus vesiculosus* or on submerged wood-work, and even on mud. Towards the close of the summer the tufts become detached, and float about in large masses, and at length are stranded in broad belts along the coast. On these, decaying under the atmosphere, Captain Carmichael first detected the curious *Sphærozyga Carmichaelii* already figured in our first volume. (Pl. CXIII.)

I have no hesitation in uniting the *E. compactus* and *E. ferrugineus* of Continental authors, with our *E. litoralis*. The characters attributed to those forms depend on age, and are gradually assumed as the plant passes its maturity and tends to decay. In the first stage of its decline it frequently becomes much matted into ropy strings, and thus becomes *E. compactus*; and eventually assumes a rusty colour, and becomes *E. ferrugineus*.

Fig. 1. Tuft of *ECTOCARPUS LITORALIS* growing on a fragment of *Fucus serratus*:—of the natural size. 2. Part of a fertile branch. 3. Ramuli from the same:—both magnified in different degrees.



PLATE CXCVIII.

LAURENCIA TENUISSIMA, Grev.

GEN. CHAR. *Frond* cylindrical or compressed, linear, pinnately branched, the apices obtuse; structure cellular, solid. *Fructification* of two kinds, on distinct individuals; 1, ovate *capsules* (*ceramidia*), furnished with a terminal pore, containing a tuft of pear-shaped spores; 2, triparted *tetraspores*, imbedded in the ramuli. LAURENCIA (*Lamour.*), —in honour of M. de la Laurencie, a French naturalist.

LAURENCIA *tenuissima*; frond filiform, terete, irregularly divided; branches long and virgate, clothed with very slender, setaceous ramuli, which taper to the base and apex.

LAURENCIA *tenuissima*, Grev. *Alg. Brit.* p. 113. Hook. *Br. Fl.* vol. ii. p. 296. Wyatt, *Alg. Danm.* no. 22. Harv. *Man.* p. 70. Harv. in Hook. *Lond. Journ. Bot.* vol. vi. p. 401. Endl. *3rd Suppl.* p. 43. J. Ag. *Alg. Medit.* p. 113. Harv. in Mack. *Fl. Hib.* part 3. p. 198.

ALSIDIUM *tenuissimum*, Kütz. *Phyc. Gen.* p. 434. t. 55. f. 1.

CHONDRIA *tenuissima*, Ag. *Sp. Alg.* vol. i. p. 352. Ag. *Syst.* p. 205. Spreng. *Syst. Veg.* vol. iv. p. 340.

GIGARTINA *tenuissima*, Lamour. *Ess.* p. 48.

FUCUS *tenuissimus*, Good. and Woodw. *Linn. Trans.* vol. iii. p. 215. t. 9. Turn. *Syn.* p. 35. Turn. *Hist.* t. 100. E. Bot. t. 1882.

HAB. On rocks and stones between tide marks; generally in shallow pools, about half-tide level. Annual. Summer. Very rare. Weymouth, Goodenough and Woodward. Isle of Wight, Rev. G. R. Leathes. Torbay, Mrs. Griffiths. Bovisand, Rev. W. S. Hore. Ballycotton, Co. Cork, Miss Ball. Jersey, Miss White and Miss Turner.

GEOGR. DISTR. Atlantic coasts of France and Spain. Mediterranean and Black Seas. East coast of North America. Tasmania.

DESCR. *Root* accompanied by interwoven fibres. *Fronds* densely tufted, from six to eight or ten inches long, half a line in diameter below, attenuated upwards. *Stem* either simple or divided into four or five principal portions, each of which is furnished with closely-set, slender, alternate, virgate, erecto-patent, undivided branches, which sometimes bear a second set of similar, but smaller branches; the whole frond, or its principal divisions having a pyramidal outline. *Branches* slender, tapering to the base and apex, more or less densely clothed with setaceous ramuli. *Ramuli* simple, two to four lines long, straight, or somewhat curved at base, and tapering to the apex, quadrifarious, irregularly inserted, either scattered or rarely somewhat fascicled. Occasionally, in luxuriant specimens, the ramuli bear a few of a second order. *Capsules* ovate, sessile, borne profusely on the sides of the ramuli, containing a tuft of pear-shaped spores. *Tetraspores* contained in the ramuli, globose, scattered. A transverse section of the stem shows six cells of large size surrounding the central one, with a wide border of smaller cells. *Substance* between cartilaginous and gelatinous,

tender, closely adhering to paper, with a slight gloss, when dry. *Colour* when growing in the shade, a pale pinkish-purple, soon fading, on exposure to sunshine, to a yellowish or greenish hue.

This is by much the most slender and delicate, as it is also the rarest, of the British species of *Laurencia*. Hitherto it has only been found on the most southern shores of England and Ireland, and this is probably the northern range of the species, as it is not known on the continent of Europe, to the north of France; and the American specimens which have reached me are chiefly from the coasts of Carolina and Florida. In Europe it is most abundant in the Mediterranean Sea. Several stations are noticed on the south coast of England, and wherever it grows it is generally found in tolerable abundance, forming dense tufts, many of which will often be found in the same pool. The favourite locality is in very shallow tide pools, fully exposed to the sun, and frequently situated but a short distance below high-water mark: thus clearly showing a partiality for warmth which marks the straggler from warmer latitudes. In such situations it frequently becomes much discoloured, the purple hue, which is natural to it, being exchanged for a greenish-yellow, at the same time that the cellular substance is much softened.

I have received fine specimens from the shores of Tasmania, where it appears to be not uncommon.

By Professor Kützing this species is referred to the genus *Alsidium*, one of the *Rhodomeleæ*; but I think few persons who have carefully studied the species of *Laurencia* in a living state can doubt its close affinity with the other individuals of that group. Indeed some specimens of *L. dasyphylla* approach it so nearly that it requires a pretty close examination to distinguish them from strong-growing individuals of *L. tenuissima*. The *L. striolata* of the Mediterranean seems scarcely distinct.

Fig. 1. *LAURENCIA TENUISSIMA*:—*of the natural size*. 2. Portion of a branch, with tetraspores in the ramuli. 3. Fertile ramulus. 4. Tetraspores from the same. 5. Apex of a branch, with *ceramidia*. 6. A ceramidium. 7. Spores from the same. 8. Transverse section of the frond.



PLATE CXCIX.

GIGARTINA MAMILLOSA, *J. Ag.*

GEN. CHAR. *Frond* cartilaginous, either filiform, compressed, or flat, irregularly divided, purplish-red; the axis, or central substance, composed of branching anastomosing longitudinal fibres; the periphery of dichotomous filaments, laxly set in pellucid jelly; their apices moniliform, strongly united together. *Fructification* double, on distinct plants; 1, external *tubercles*, containing, on a central placenta, dense clusters of *spores*, scattered among the filaments of the periphery. GIGARTINA (*Lamour.*),—from *γυαρον*, a *grape stone*; which the tubercles resemble.

GIGARTINA *mamillosa*; frond flabelliform, dichotomous, plane, channelled; segments wedge-shaped, cleft; tubercles roundish or ovate, pedicellate, scattered over the disc of the frond.

GIGARTINA *mamillosa*, *J. Ag. Alg. Medit.* p. 104. *Endl. 3rd Suppl.* p. 42.

MASTOCARPUS *mamillosus*, *Kütz. Phyc. Gen.* p. 398.

CHONDRUS *mamillosus*, *Grev. Alg. Brit.* p. 127. *Hook. Br. Fl.* vol. ii. p. 302. *Wyatt, Alg. Danm.* no. 117. *Harv. in Mack. Fl. Hib.* part 3. p. 201. *Harv. Man.* p. 77.

SPHÆROCOCCUS *mamillosus*, *Ag. Syn.* p. 29. *Lyngb. Hyd. Dan.* p. 14. t. 5. *Ag. Sp. Alg.* vol. i. p. 260. *Ag. Syst.* p. 220. *Hook. Fl. Scot.* part 2. p. 102. *Grev. Fl. Edin.* p. 295. *Spreng. Syst. Veg.* vol. iv. p. 336.

FUCUS *mamillosus*, *Good. and Woodw. in Linn. Trans.* vol. iii. p. 174. *Turn. Syn.* p. 237. *Turn. Hist.* t. 218. *E. Bot.* t. 1054.

FUCUS *polymorphus*, (*fourth series*) *Lam. Diss.* p. 3. t. 17. f. 37. t. 18. f. 38.

FUCUS *echinatus*, *Stack. Ner. Brit.* p. 65. t. 12.

FUCUS *canaliculatus* β., *Huds. Fl. Ang.* p. 583.

FUCUS *ceranoides*, vars. *Lightf. Fl. Scot.* p. 916. *Gmel. Hist.* p. 115. *With. Arr.* vol. iv. p. 99.

FUCUS *alveolatus*, *Esper. Ic.* p. 139. t. 70.

HAB. On rocks near low-water mark. Perennial. Winter. Common on all our rocky shores.

GEOGR. DISTR. Atlantic shores of Europe and North America.

DESCR. *Root*, a membranous expansion. *Fronds* tufted, from four to eight inches long or more, rising with an undivided stem or stipes, which is filiform at base, but almost immediately becomes compressed, and then flattened, widening gradually upwards till it attains from an eighth to a quarter of an inch in breadth. At an inch or two above the base, the stipe forks; and this mode of branching, repeated again and again, results in a many times dichotomous, flabelliform frond. The branches are more or less channelled by the introflexion of the margin; they are very commonly twisted, often in a spiral manner; and the upper ones are gradually more and more

expanded, often becoming broadly wedge-shaped. Sometimes the frond remains nearly linear throughout. The surface of barren specimens is smooth, but fertile individuals are more or less densely sprinkled over with filiform processes, which are sometimes prolonged to two or three lines; but more commonly are shorter, swelling in their upper part into an oval or globose tubercle. These processes, though sometimes borne on both surfaces, are generally most abundant on the channelled side. The *tubercles* contain, within a thick wall composed of radiant fibres, an elliptical mass of densely packed, minute *spores*. I have not seen *tetraspores*. The *structure* of the frond is dense. Its *substance* tough, between cartilaginous and leathery, very rigid when dry, and not adhering to paper. The *colour* a very dark, brownish purple, becoming brighter and more pinky after long steeping in fresh water.

A common species on all parts of our shores, and dispersed throughout the Atlantic basin. Notwithstanding its well-marked characters, it has been confounded at one time with *Fucus canaliculatus*: an error hardly to be anticipated, when the substance and colour are so exceedingly unlike; and afterwards with *Chondrus crispus*, to which there is a closer resemblance, though the channelled frond, rough with papillæ, clearly distinguish the present plant to the naked eye; while a difference in structure has latterly caused them to be placed in distinct genera. *Gigartina mamillosa* was first accurately determined and described by Goodenough and Woodward, in 1797. Its claims to specific rank have been generally admitted since that time, except by Lamouroux, who considers it a variety of *C. crispus*. Some states of the latter it, indeed, closely resembles, but is always distinguished by the channelled frond. Its officinal properties are similar to those of the *Chondrus*, and it is, on some shores, indiscriminately collected with that species, and dried as “*Carrigeen*.”

I regret that our plate has been printed in rather too pale an ink.

Fig. 1. CHONDRUS MAMILLOSUS:—*of the natural size*. 2. Apex of a fertile frond:—*slightly magnified*. 3. Vertical section of a tubercle. 4. Spores from the same. 5. Vertical semisection of the frond. 6. Transverse section of the same:—*highly magnified*.



PLATE CC.

ECTOCARPUS GRANULOSUS, *Ag.*

GEN. CHAR. *Frond* capillary, jointed, olive or brown, flaccid, single-tubed. *Fruit* either spherical, elliptical, or lanceolate *utricles* (or *spores*) borne on the ramuli, or imbedded in their substance. ECTOCARPUS (*Lyngb.*),—from *εκτος*, *external*, and *καρπος*, *fruit*.

ECTOCARPUS *granulosus*; filaments olive, the principal divisions slightly entangled; branches free, feathery; the lesser branches and ramuli opposite, spreading; utricles elliptical, dark coloured, sessile on the ramuli.

ECTOCARPUS *granulosus*, *Ag. Syst.* p. 163. *Ag. Sp. Alg.* vol. ii. p. 45. *Harv. in Hook. Fl. Brit.* vol. ii. p. 326. *Harv. in Mack. Fl. Hib.* part 3. p. 182. *Endl. 3rd Suppl.* p. 21. *Harv. Man.* p. 42. *Wyatt, Alg. Danm.* no. 38.

CONFERVA *granulosa*, *E. Bot.* t. 2351.

HAB. On rocks; also on Corallines and various other Algæ, in rock-pools between tide marks. Annual. May and June. Not uncommon on the English and Irish coasts.

GEOGR. DISTR. Heligoland. Coast of France.

DESCR. *Root*, a small disc. *Filaments* more or less densely tufted, capillary, from four to eight or ten inches long, much branched, with more or less of a principal, undivided stem, furnished with lateral branches of unequal length, so that the habit is often virgate. The chief divisions somewhat matted together, but all the lesser ones free and distinct, standing out on all sides, in a feathery manner. Lesser branches and ramuli very generally opposite, sometimes alternate, spreading at wide angles, unequal, long and short intermixed together without order, somewhat attenuated. *Apices* rather acute. *Articulations* about as long as broad, faintly striate longitudinally. *Utricles* abundantly scattered on the ramuli, elliptical, dark-coloured, with a narrow limbus, sessile on the upper faces of the ramuli. *Colour*, when quite fresh, a clear olive, becoming green in fresh water, and often yellowish as the plant increases in age. *Substance* soft, but not gelatinous, adhering to paper in drying.

A well-marked and large growing species, originally discovered by Mr. Borrer, and first described and figured in English Botany. It is by no means uncommon on various parts of the coasts, usually growing on the smaller Algæ in tide-pools, though occasionally flourishing on the fronds of *Laminariæ*. The opposite branches and ramuli, bearing dark-coloured elliptical utricles on their upper side, readily distinguish this plant from any of its British congeners. The species, which most nearly

approach it, are *E. sphærophorus* and *E. brachiatus*, but both these differ in fructification. In some varieties the ramuli are not regularly opposite. It is frequently a difficult matter to trace the affinity of such wayward forms; and possibly one or two species, now confounded with *E. granulosus*, may eventually be separated.

Fig. 1. Tuft of ECTOCARPUS GRANULOSUS :--*of the natural size.* 2. Portion of a fertile branch. 3. Ramuli and utricles from the same :--*both magnified in different degrees.*



PLATE CCI.

CORALLINA SQUAMATA, *Park.*

GEN. CHAR. *Fronde* filiform, articulated, branched (mostly pinnate), coated with a calcareous deposit. *Fructification*; turbinate or obovate, mostly terminal *ceramidia*, pierced at the apex by a minute pore, and containing a tuft of erect, pyriform, or club-shaped, transversely parted *tetraspores*. CORALLINA (),—from *Coralium*, coral, which these plants resemble in their stony nature.

CORALLINA *squamata*; decompound-pinnate; lower articulations cylindrical, scarcely longer than their breadth; upper obconical or obcordate, compressed, two-edged, their upper angles sharp and prominent; ultimate ramuli very slender, acute.

CORALLINA *squamata*, Parkinson, 1296. *Ellis*, *Cor. Pl.* p. 24. fig. c. C. *Ellis and Soland. Zoop.* p. 117. *Turt. Gmel.* vol. iv. p. 671. *Turt. Br. Faun.* p. 211. *Stew. Elem.* vol. ii. p. 439. *Lamour. Cor. Flex.* p. 287. *Lam. Coral.* p. 129. *Lam. An. s. Vert.* vol. ii. p. 329. *Gray, Br. Pl.* vol. i. p. 340. *Fl. Br. An.* p. 515. *Johnst. Br. Sponges and Corallines*, p. 222. *Decaisne, Ess.* p. 108, *Kütz. Phyc. Gen.* p. 388. *Endl. 3rd Suppl.* p. 48.

HAB. On submarine rocks, at the extremity of low-water mark. Perennial. Summer. South coast of England, *Ellis*, &c. Abundant at Miltown Malbay, West of Ireland, *W. H. H. Youghal*, *Miss Ball*. Jersey, *Miss Turner*.

GEOGR. DISTR. Atlantic shores of France and Spain. Canary Islands.

DESCR. *Root*, a widely spreading, calcareous crust. *Fronde*s densely tufted, forming frequently large patches some yards in breadth, four to six inches high, twice as thick as hog's bristle, with an undivided or once or twice forked stem, set with distichous erecto-patent, more or less decompoundly pinnate branches. These branches are very irregular in length and in their degree of composition, some specimens being comparatively bare, others closely and many times pinnate. The penultimate branches or *plumules*, are from half an inch to an inch long, with a lanceolate or obovate outline, closely pectinato-pinnate, the pinnules opposite, a pair rising from every joint, subulate, and either simple or minutely pinnulate. The ultimate ramuli at the apices of the branches are di-trichotomous, a circumstance which, no doubt, accounts for the irregularity of ramification. *Articulations* of the lower part of the stem, very short, rounded, bead-like, with obtuse angles; the upper ones gradually becoming longer, broader, and flatter, with more and more prominent upper angles, until towards the summit of the stem, as well as in the lesser branches, all the articulations are broadly obconic, compressed, with very salient and acute upper angles. Articulations of the subulate ramuli not half the diameter of the others, more cylindrical, and thrice as long as their breadth, the terminal one acute. *Conceptacles* (probably of three kinds, two of which only are known to me); 1, urn-shaped, formed out of the last articulation of a branch, or ramulus, simple, or crowned at its superior angles with pair of horn-like ramuli, or

with another series of similar conceptacles of a smaller size; in these (fig. 3.) I have observed *trispores* (fig. 4). 2, hemispherical conceptacles, of a very minute size, resembling grains of sand, plentifully scattered, like warts, over the surface, hollow, exhibiting (when the calcareous matter is removed) a beautifully tessellated surface, and containing a tuft of crescent-shaped, transversely parted tetraspores (fig. 8). When the frond is macerated in acid, the lime is dissolved, and the joints exhibit regular transverse bands, and a longitudinal section shows the substance to be composed of very slender, perpendicular, elongated, cylindrical cells, alternating with smaller ones, and the outer ones, curving outwards at the tips, and ending at the circumference in a minute cell. *Colour*, a dark purple, soon fading on exposure.

This species was noticed at an early period, and has been generally kept separate from *C. officinalis*, which it closely resembles, by most authors who have written on the subject. It differs from *C. officinalis* chiefly in the form of the upper joints of the stem and branches, which are broad and flat, with prominent and usually sharp angles. As far as my experience goes, these characters are pretty constant.

The greatest anomaly which I have observed in this plant, is in the fructification, and this is so remarkable that had I not found it on specimens from the same locality, and otherwise the same, I should have been afraid to describe plants with such different fruit as identical. There appear to be three distinct forms of *Ceramidium* borne by *C. squamata*; the first, that proper to the genus, and which I have not found on the specimens figured: secondly, that proper to *Jania* (fig. 2, 3); and thirdly, that proper to *Amphiroa* (fig. 7). These two last I have found abundantly both on French and Irish specimens. Both the latter kinds of *Ceramidium* contain tetraspores, but those found in one of them are deficient in one joint. It is rather unfortunate for the stability of the genera into which the Linnæan *Corallina* has been split, to find an acknowledged species of one of the genera producing the fruit attributed to *both* the others!

Fig. 1. CORALLINA SQUAMATA:—*of the natural size*. 2. Apex of a fertile branch, with *urn-shaped* conceptacles. 3. A conceptacle, bearing two lesser ones. 4. *Trispores* from the same. 5. A branch with *wart-like* conceptacles, in its natural state. 6. The same, treated with acid, the lime being removed. 7. Terminal joints with fruit, from the same, showing a longitudinal section of the joint, and the interior of one conceptacle. 8. Tetraspores. 9. Basal joints. 10, 11. Cells of which the frond is built up:—*all more or less highly magnified*.

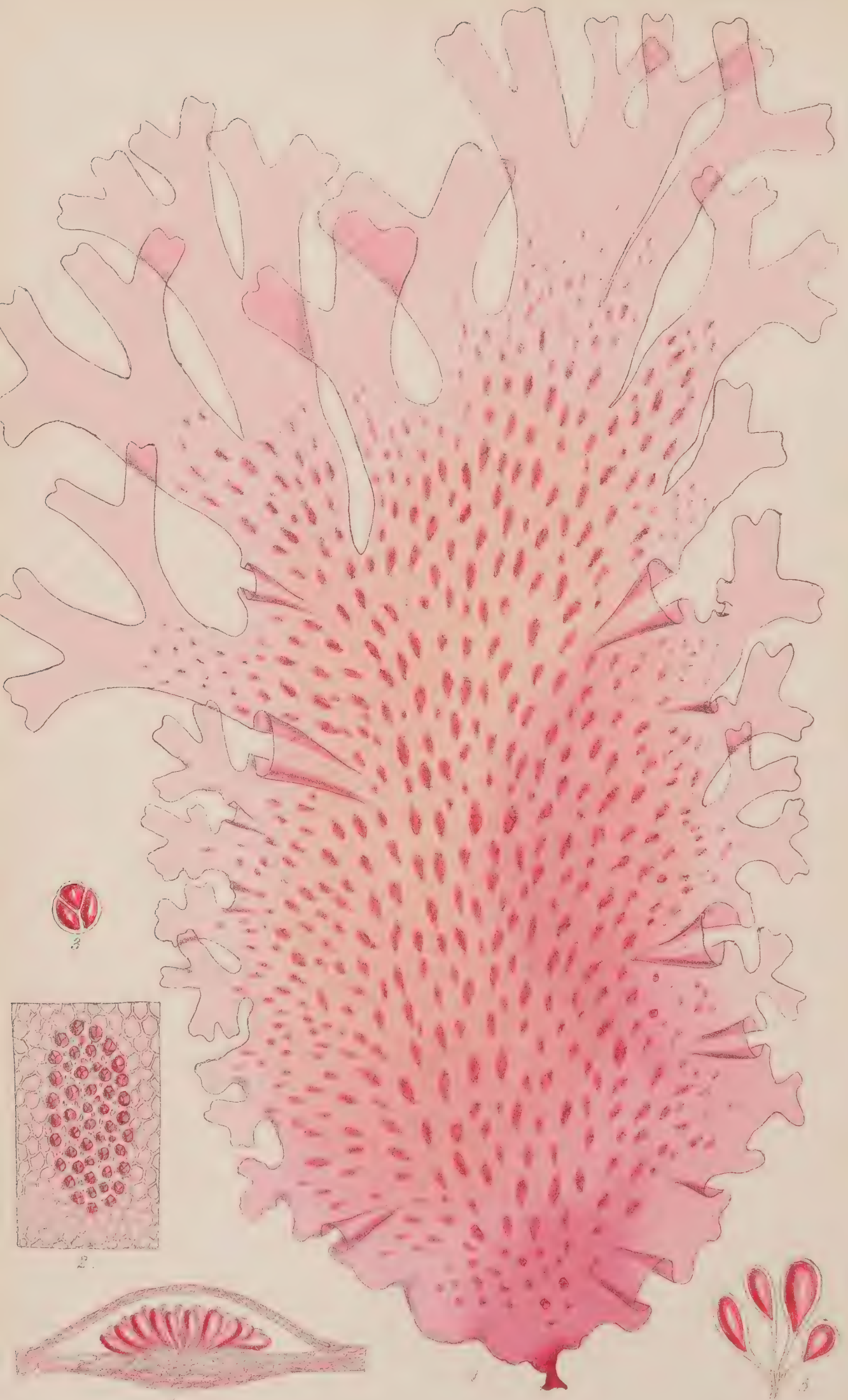


PLATE CCII.

NITOPHYLLUM PUNCTATUM, *Grev.*

GEN. CHAR. *Frond* membranaceous, reticulated, rose-red (rarely purplish), irregularly cleft, veinless, or furnished with irregular veins towards the base. *Fructification* two-fold, on distinct plants; 1, convex *tubercles* (*coccidia*) immersed in the frond, and containing a mass of spores; 2, *tetraspores*, grouped into definite *sori* or spots, variously scattered over the frond. NITOPHYLLUM (*Grev.*),—corruptly formed from *nitor*, to *shine*, and *φύλλον*, a *leaf*.

NITOPHYLLUM *punctatum*; frond very thin and delicate, destitute of nervures, either regularly dichotomous, or cleft into two or three principal segments, whose margins are fringed with dichotomous lobes; axils rounded; spots of granules large, oblong, scattered over the whole surface of the frond.

NITOPHYLLUM *punctatum*, *Grev. Alg. Brit.* p. 79. t. 12. *Hook. Br. Fl.* vol. ii. p. 287. *Harv. in Mack. Fl. Hib.* part 3. p. 192. *Harv. Man.* p. 57. *Hook. fil. et Harv. Lond. Journ.* vol. vi. p. 403.

AGLAIOPHYLLUM *punctatum*, *Mont. Endl. 3rd Suppl.* p. 52. *Kütz. Phyc. Gen.* p. 443.

WORMSKIOLDIA *punctata*, *Spreng. Syst. Veg.* vol. iv. p. 331.

DELESSERIA *punctata*, *Ag. Sp. Alg.* vol. i. p. 186. *Ag. Syst.* p. 252. *Hook. Fl. Scot.* part 2. p. 101. *Grev. Fl. Edin.* p. 294.

DELESSERIA *ulvoides*, *Hook. Fl. Scot.* part 2. p. 101.

FUCUS *punctatus*, *With. Br. Ar.* (Ed. 6) vol. iv. p. 120. *E. Bot.* t. 1575. *Turn. Hist.* t. 71.

FUCUS *ulvoides*, *Turn. Hist.* t. 80.

ULVA *punctata*, *Stack. in Linn. Trans.* vol. iii. p. 236.

Var. *β. ocellatum*; frond with a roundish outline, cleft nearly to the base, the segments repeatedly dichotomous, linear.

NITOPHYLLUM *punctatum*, *β. ocellatum*, *Harv. Man.* p. 57.

NITOPHYLLUM *ocellatum*, *Grev. Alg. Brit.* p. 78. *Hook. Br. Fl.* vol. ii. p. 286. *Wyatt, Alg. Danm.* no. 15. *J. Ag. Alg. Medit.* p. 156.

AGLAIOPHYLLUM *ocellatum*, *Mont. in Zanard. Saggio.*, &c. p. 46. *Endl. 3rd Suppl.* p. 52. *Kütz. Phyc. Gen.* p. 443.

DELESSERIA *ocellata*, *Lam. Ess.* p. 125. *Ag. Sp. Alg.* vol. i. p. 187. *Ag. Syst.* p. 252. *Grev. Crypt.* t. 347.

WORMSKIOLDIA *ocellata*, *Spreng. Syst. Veg.* vol. iv. p. 331.

HALYMENIA *ocellata*, *Duby, Bot. Gall.* p. 945.

FUCUS *ocellatus*, *Lam. Diss.* t. 32.

FUCUS *granateus*, *Lam. Diss.* t. 33. f. 3, 4.

Var. *γ. crispatum*; frond thickish, cleft nearly to the base, the segments irregularly dichotomous, linear, with the margin strongly curled.

Var. *δ. Pollexfenii*; frond proliferous, the young segments broadly obovate, rounded, very entire, or bifid.

NITOPHYLLUM POLLEXFENII, *Grev. MSS. in Herb.*

Var. *ε. fimbriatum*; segments broadly obovate, fringed with narrow, forked processes.

HAB. Attached to various Algæ, in pools at the extremity of low-water mark; but, more abundantly, and of much larger size, beyond the tidal influence in 4–15 fathom water. Annual. Summer. Not uncommon on the British and Irish shores, in many localities, from Orkney to Cornwall. Exceedingly abundant and of great size on the coast of Antrim; and in Roundstone Bay, Galway. *β.* Torquay and Budleigh, *Mrs. Griffiths*. Penzance, *Mr. Ralfs*. Mount Edgecombe, *Rev. W. S. Hore*. Forres, *Mr. Brodie*. Bantry Bay, *Miss Hutchins*. *γ.* Kilkee, *W. H. H.* Roundstone Bay, *Mr. M'c Calla*. Mount Batten, *Mr. Rohloff*. *δ.* Orkney, *Rev. J. H. Pollexfen*. *ε.* Roundstone Bay, *Mr. M'Calla*.

GEOGR. DISTR. Atlantic shores of Europe and North America. Mediterranean Sea. Tasmania.

DESCR. *Root*, a small disc. *Fronde*s growing in tufts, exceedingly variable in size and form, according to locality: commonly from four to twelve or even twenty inches in length, and as much in breadth; and occasionally measuring five feet in length, and three in breadth, variously divided. In some specimens the main frond is nearly simple, or but once forked, broadly obovate, or oblong, with the margin divided into numerous linear lobes, from half an inch to an inch in width, two or three inches long, once or twice forked, their ultimate lobes somewhat digitate. The margin of such specimens is so extended in proportion to the disc, as to form large undulations or folds, when the plant is floating in water; and when displayed on paper the parts lie over each other, rendering it difficult to display the form fully. The opposite to this form is found in our var. *β.* in which the whole frond is divided to the base into linear, dichotomous lobes, with a perfectly flat margin. In *γ.* the substance is thick, of a darker colour, brownish when dry; the frond is from half an inch to an inch broad, six or eight inches long, dichotomous, with the margin minutely, but strongly curled: *δ.* is also thicker than the usual form, cuneate at base, variously lobed, the lobes flat, broadly obovate, with a rounded margin; and it often has the appearance of sprouting from an old frond: *ε.* is much thinner than the others, without fruit, roundish, the margin cut into minute forked lobes, not a line in breadth. There are many other states, which connect these several varieties together. *Fructification* thickly scattered over the whole surface; *tubercles* as large as turnip-seed, hemispherical, containing a cluster of stalked, obovate spores. *Spots* of tetraspores large, a line or more in length, oblong, dark-red, containing numerous grains. *Substance* delicately membranaceous, closely adhering to paper, and glossy when dry. *Colour*, a fine rosy pink, generally well preserved in drying.

Plate CCII. Fig. 1. NITOPHYLLUM PUNCTATUM; a small plant, of the normal form:—of the natural size. 2. A sorus. 3. A tetraspore from the same. 4. Vertical section of a tubercle. 5. Tuft of spores from the same.

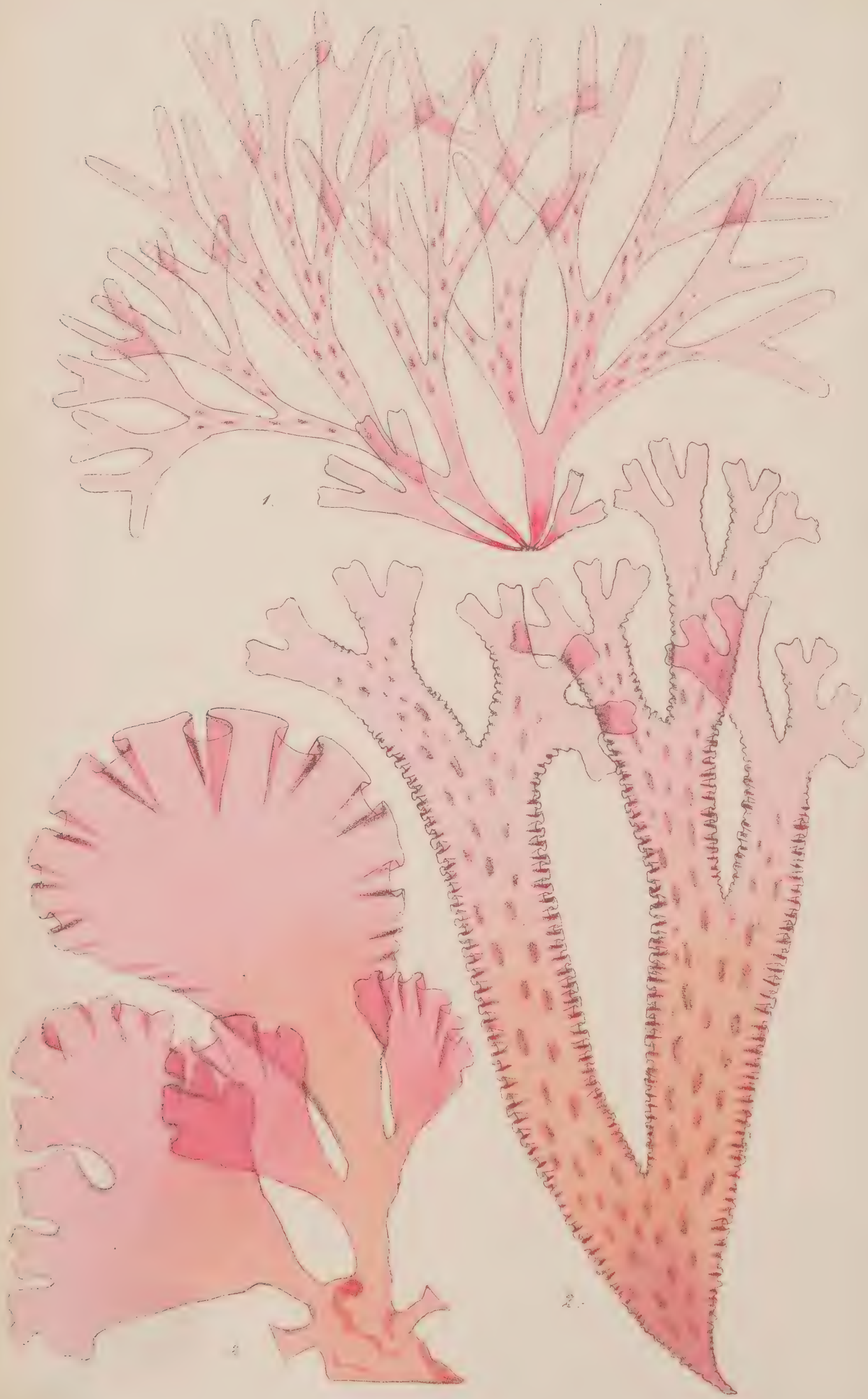


PLATE CCIII.

NITOPHYLLUM PUNCTATUM; vars. β . γ . δ .

(For description, see last folio.)

I have thought it necessary, for the proper illustration of *Nitophyllum punctatum* to give two plates, showing some of the principal forms which this variable plant assumes. Some of these look so distinct that many authors regard them as separate species, and it is not without having carefully examined the subject and consulted a very extensive suite of specimens, that I have formed an opposite opinion.

At Plate CCII. is represented what I regard as the normal or typical form of the species. This varies much in size, and sometimes grows to the length of many feet, in which case the dichotomous lobes are often several inches in length, but their proportions, as respects the whole frond, are not much altered. Between this form and fig. 1. of PLATE CCIII. which represents our var. β , the *Nitophyllum ocellatum* of authors, there appears at first sight a considerable difference; the extreme and regular division of this variety, and the flatness of its margin, showing apparently well marked characters. But innumerable intermediate forms connect the two; so that Dr. Greville and Mrs. Griffiths, who formerly recognised two species, now regard *N. ocellatum* as merely an extreme state of *N. punctatum*.

Our var. γ (Pl. CCIII. fig. 2.) is in some degree an intermediate form, exhibiting the dichotomous division of one, with the curled margin of the other. At the same time, its thicker substance, dark colour, and the minute and close curling of the margin mark a distinct variety. This variety has a strong resemblance to *N. crispatum* of the Flora Antarctica, but differs in fructification, the spots of granules in that species being as minute, as in *N. Hilliæ*.

Our var. δ (Pl. CCIII. fig. 3.) is still another form. In this, the lobes, instead of being narrow and forked, are the widest

portions of the frond, and become singularly rounded and almost reniform. The outline of many specimens of this variety, which I have only seen in the Herbarium of Mr. Pollexfen, to whom I am indebted for the specimen figured, is very similar to that of *Kalymenia reniformis*. Like var. γ , its substance is thicker, and colour generally more full than in either of the preceding states of the species.

Var. ϵ is like a combination of vars. α and δ ; the lobes of the frond being obovate as in the latter, but fringed with dichotomous lobes as in the former. Its claim to rank as a distinct variety rests on the narrowness and minute division of these marginal lobes. I regret that there was not room to introduce a figure of this variety into our plate.

Fig. 1. NITOPHYLLUM PUNCTATUM:— β . ocellatum. 2. γ . crispatum. 3. δ . Pollexfenii:—*all the natural size*.



PLATE CCIV.

FUCUS VESICULOSUS, *Linn.*

GEN. CHAR. *Frond* linear, either flat, compressed or cylindrical, dichotomous (rarely pinnated), coriaceous. *Air-vessels* when present, innate, simple. *Receptacles* either terminal or lateral, filled with mucus traversed by a net-work of jointed fibres, pierced by numerous pores which communicate with immersed, spherical *conceptacles*, containing parietal *spores* or *antheridia*, or both. FUCUS (*L.*),—*φυκος*, a sea-weed.

FUCUS *vesiculosus*; frond flat, coriaceous, thick, linear, dichotomous, quite entire at the margin, mid-ribbed; air-vessels globose or elliptical, mostly in pairs (often absent); receptacles turgid, elliptical, ovate, or lanceolate, terminal.

FUCUS *vesiculosus*, *Linn. Sp. Pl.* p. 1626. *Linn. Fl. Lap.* p. 366. *Huds. Fl. Ang.* p. 576. *Lightf. Fl. Scot.* p. 904. *Stack. Ner. Brit.* p. 3. t. 2. and p. 12. t. 6. *Esper. Ic.* p. 35. t. 12. 13. and p. 160. t. 83. 84. *Velley*, t. 1. *With. Bot.* vol. iv. p. 84. *Gunn. Fl. Norv.* vol. i. p. 48. *Roth, Fl. Germ.* vol. iii. p. 442. *Turn. Syn.* p. 117. *Turn. Hist.* t. 88. *Lamour. Ess.* p. 18. *E. Bot.* t. 1066. *Lyngb. Hyd. Dan.* p. 3. t. 1. *Ag. Sp. Alg.* vol. i. p. 87. *Ag. Syst.* p. 275. *Grev. Crypt. Fl.* t. 319. *Grev. Alg. Brit.* p. 12. t. 2. *Hook. Br. Fl.* vol. ii. p. 267. *Wyatt, Alg. Danm.* no. 152. *Harv. in Mack. Fl. Hib.* part 3. p. 168. *Harv. Man.* p. 20. *Kütz. Phyc. Gen.* p. 351. t. 33, 34, 35, 36. *Endl. 3rd. Suppl.* p. 29. *Mont. Fl. Canar. Cell.* p. 139. *Mont. Fl. Algier.* p. 21. *Harv. in Bot. Beechey*, p. 163 and 406.

FUCUS *divaricatus*, *Linn. Sp. Pl.* p. 1627. *Lightf. Fl. Scot.* p. 909. *Esp. Ic.* t. 11.

FUCUS *inflatus*, *Linn. Sp. Pl.* p. 1627. *Lightf. Fl. Scot.* p. 910.

FUCUS *spiralis*, *Linn. Sp. Pl.* p. 1627. *Stack. Ner. Brit.* t. 5. *E. Bot.* t. 1685. *Fl. Dan.* t. 286. *Huds. Fl. Ang.* p. 577. *Lightf. Fl. Scot.* p. 911.

FUCUS *volubilis*, *Huds. Fl. Ang.* p. 577.

FUCUS *Sherardi*, *Stack. Ner. Brit.* p. 72. t. 13. *J. Ag. Alg. Medit.* p. 46.

FUCUS *linearis*, *Huds. Fl. Ang.* p. 578.

FUCUS *distichus*, *Lightf. Fl. Scot.* p. 912. (not of *Linn.*)

β. subecostatus; very small, densely tufted, with an indistinct mid-rib, and destitute of vesicles.

FUCUS *balticus*, *Ag. Sv. Bot.* t. 516. *Grev. Crypt. Fl.* t. 181.

HAB. On rocks and stones left exposed at low water; also on artificial piers and quays in æstuaries, extending up rivers as long as the water remains sensibly brackish. Perennial. Summer and winter. Very abundant on the British coasts. *β.* in salt marshes, occasionally flooded. Near Dunstaffnich Castle and Isle of Kerera, *Mr. Maughan*. Appin, *Capt. Carmichael*. Arran, *Sir W. J. Hooker*. Bute, *Dr. Greville*. Baldoyle and Roundstone Bay, (bearing fructifications), *Mr. M'Calla*.

GEOGR. DISTR. Atlantic shores of Europe and North America. Mediterranean Sea. Baltic. The Icy Sea. White Sea. Iceland. Greenland. Nova Zembla. Spitsbergen. California. Sitcha and Sachalin. Siberia at Ochotsk and Kamtskatka. Canary Islands. South Brazil (?). Cape of Good Hope (?), *Ecklon*.

DESCR. *Root*, an expanded, conical disc. *Fronde*s from two inches to two or three feet in length, and from a line to nearly an inch in breadth, flat, furnished with a strong, compressed, percurrent mid-rib, many times dichotomous, sometimes spirally twisted; the margin very entire. *Air-vessels* generally in pairs, one at each side of the mid-rib, spherical or oval, their size varying with the breadth of the frond, formed at uncertain intervals along the segments. *Receptacles* terminal, turgid, and full of lax mucus, variable in form, elliptical, ovate, or linear-lanceolate, sometimes forked, dioecious; those producing spores, of a greenish-olive colour; those with antheridia, a more or less bright orange yellow. *Substance* thickish and very tough. *Colour*, a dark olive, paler in the younger parts.

The commonest and one of the most widely diffused species of the restricted genus *Fucus*. It abounds along the shores of the Northern Atlantic, extending even to the tropics, and is said to have been found in the Southern portion of that Ocean, but the Southern localities want confirmation. In the Pacific, it has been collected on the N. West coast of America.

As may be judged by the numerous synonyms, this is rather a variable plant, but the variations may be summed up in a few words. The first and most obvious is in size; some specimens, fully grown and in fruit, being not an inch in length, while others extend to several feet. The dwarfish individuals, constituting our var. β , grow in brackish water and in muddy places. Other varieties are destitute of air-vessels; or have the air-vessels of a lengthened figure: and others vary in the shape of the fructification, the receptacle being sometimes globose, sometimes ellipsoidal, and sometimes spindle-shaped. Lastly, the frond is frequently spirally twisted. On characters such as these, the *eight* book-species, quoted as synonyms, have been constituted.

Fucus vesiculosus is largely used in the manufacture of kelp; and also yields *mannite* in considerable quantity. In the north of Europe, when the vegetation of the land ceases, or is covered with snow, it furnishes an abundant winter fodder for cattle, which regularly visit the shores, at the retreat of the tide, in search of it. Various are the uses to which the Icelanders and Greenlanders apply it, as Linnæus and others inform us.

Fig. 1. *FUCUS VESICULOSUS*; a branch. 2. A pair of lanceolate receptacles:—*both of the natural size*. 3. Section of a spore-bearing receptacle. 4. *Spores* and paraphyses from the same:—*both magnified*.

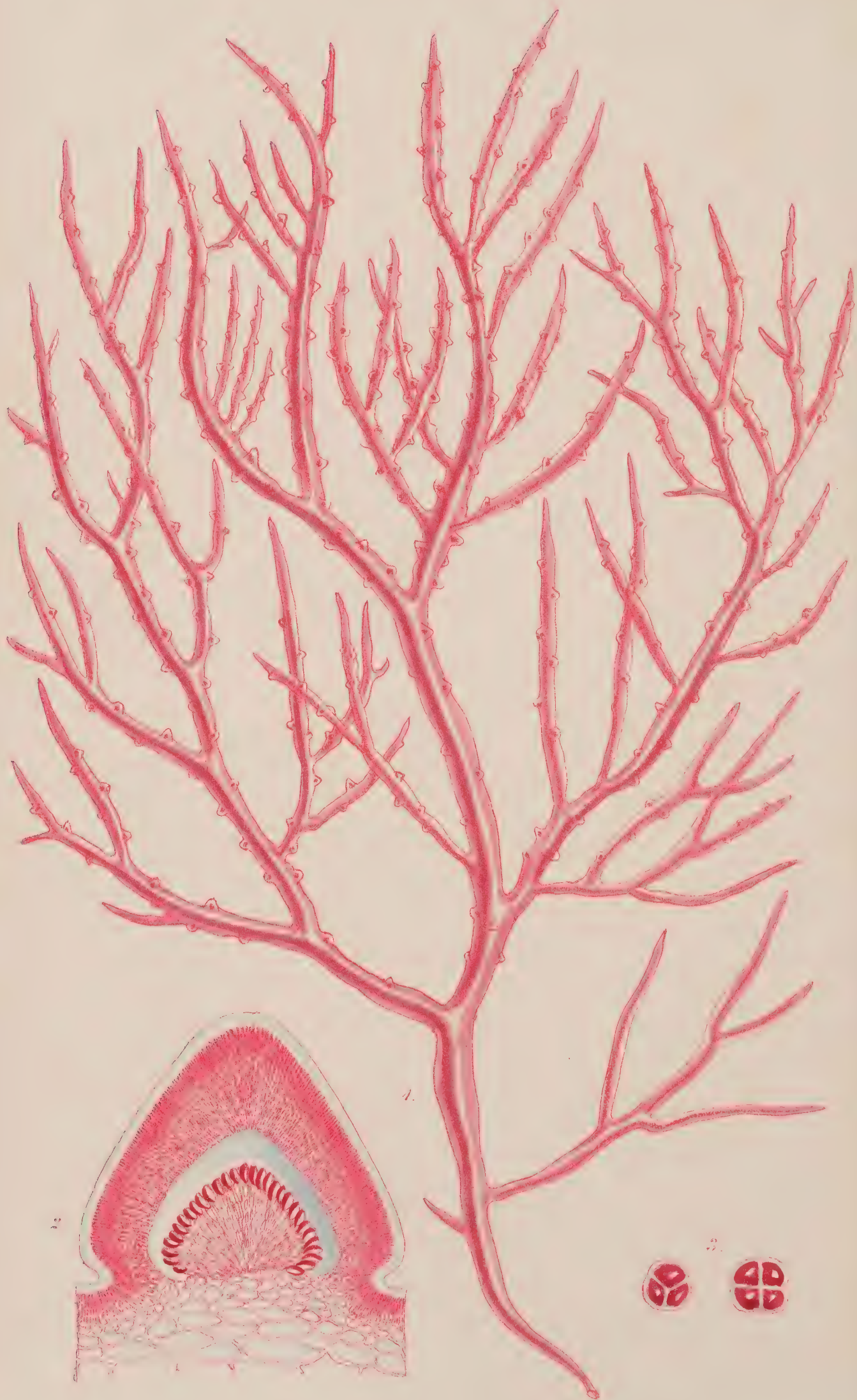


PLATE CCV.

GRACILARIA COMPRESSA, *Grev.*

GEN. CHAR. *Fronde* filiform, or rarely flat, carnosu-cartilaginous, continuous, cellular; the central cells very large, empty, or full of granular matter; those of the surface minute, forming densely packed, vertical filaments. *Fructification* of two kinds on distinct individuals; 1, convex *tubercles* (*coccidia*) having a thick pericarp composed of radiating filaments, containing a mass of minute spores on a central placenta; 2, *tetraspores* imbedded in the cells of the surface. GRACILARIA (*Grev.*)—from *gracilis*, slender.

GRACILARIA *compressa*; frond succulent, brittle, somewhat compressed, alternately or subdichotomously branched; branches long and mostly simple, tapering to a fine point; tubercles ovate or subglobose, sessile, scattered plentifully over the branches; tetraspores tripartite or cruciate.

GRACILARIA *compressa*, *Grev. Alg. Brit.* p. 125. *J. Ag. Alg. Medit.* p. 151.

PLOCARIA *compressa*, *Endl. 3rd Suppl.* p. 51. *Mont. Fl. Alger.* p. 71.

GIGARTINA *compressa*, *Hook. Br. Fl.* vol. ii. p. 299. *Wyatt, Alg. Danm.* n. 25. *Harv. Man.* p. 74. *De Not. Alg. Ligust.* p. 14.

SPHÆROCOCCUS *compressus*, *Ag. Sp. Alg.* vol. i. p. 308. *Ag. Syst.* p. 233. *Spreng. Syst. Veg.* vol. iv. p. 338. *Kütz. Phyc. Gen.* p. 408.

SPHÆROCOCCUS *lichenoides*, *Grev. Crypt. Fl.* t. 341. (*not of Agardh.*)

HAB. Cast on shore from deep water, attached to corallines, &c. Annual. Summer. Very rare. At Sidmouth, *Mrs. Griffiths* (1813) and *Miss Cutler*. Jersey, *Miss Turner*.

GEOGR. DISTR. Atlantic coasts of France and Spain. Mediterranean Sea.

DESCR. *Root*, a small expanded callus. *Fronde*s several from the same base, six to twelve inches long or more, from a line to two lines in diameter, brittle, much, but very irregularly, branched. *Branches* sub-compressed, sometimes nearly distichous, frequently more or less quadrifarious, alternate or secund, rarely opposite, simple or forked, elongated and gradually tapering to an acute point, sometimes much attenuated, naked or furnished with a few scattered subulate ramuli, or bearing (in large specimens) a second or third series of lesser branches. *Tubercles* large and prominent, obtusely conical, sessile on the branches, over which they are very plentifully scattered, containing, under a thick wall composed of radiating fibres, a conical mass of minute *spores* attached to filaments issuing from a central point. *Tetraspores* imbedded in the surface cells of distinct plants, irregularly dispersed, roundish, either tripartite or cruciate. *Substance*, when fresh, very tender and brittle, succulent, and breaking by its own weight if hastily removed from the water; becoming tough in drying. *Colour*, a transparent, dull red, which becomes much brighter after the plant has been steeped in fresh water.—It adheres to paper in drying, and shrinks considerably.

This beautiful plant was added to the British Flora by Mrs. Griffiths in the year 1813, and has been occasionally, but very irregularly, found in the same locality since that period. In some seasons it makes its appearance in considerable plenty, and may not again be seen for several years. I believe it has always been found among rejectamenta, as if cast up from deep water. The south coast of England is perhaps its northern limit. On the French and Spanish coasts, and especially in the Mediterranean, it is much more abundant; but British specimens are quite as large and as abundantly covered with fructification as any from more southern stations. In many characters it bears a close resemblance to the *G. lichenoides* of the East Indies, with which Dr. Greville formerly associated it; and Mrs. Griffiths, in the belief that these plants were identical, prepared a *pickle* and a *preserve*—both of which proved excellent in flavour as well as ornamental—from our British *G. compressa*; thus proving that our plant is quite as valuable for the table as its Indian cousin.

G. compressa has something the aspect of *G. confervoides*, but may always be known by its more succulent frond, and very different substance. It is as soft and brittle, as *G. confervoides* is hard and tenacious. It also bears some resemblance to the narrow variety of *G. multipartita*, but is more cylindrical, and of a different, and much brighter colour.

Fig. 1. GRACILARIA COMPRESSA :—*the natural size.* 2. Section of a tubercle.
3. Tetraspores :—*both highly magnified.*



PLATE CCVI.

CERAMIUM GRACILLIMUM, *Griff. et Harv.*

GEN. CHAR. *Frond* filiform, one tubed, articulated; the dissepiments coated with a stratum of coloured cellules, which sometimes extend over the surface of the articulation. *Fructification* of two kinds, on distinct individuals; 1, *tetraspores* either immersed in the ramuli or more or less external; 2, sessile, roundish *receptacles* (*favellæ*), having a pellucid limbus, containing minute, angular spores, and subtended by one or more, short, involucral ramuli. CERAMIUM (*Roth.*),—from *κεραμος*, a *pitcher*; but the fruit is not pitcher shaped.

CERAMIUM *gracillimum*; frond excessively slender, of nearly equal diameter throughout, very flaccid and gelatinous, dichotomous; the branches set with minute, flabelliform, dichotomous ramuli; articulations colourless, those of the branches five or six times as long as broad, those of the ramuli very short; dissepiments opaque, purple; *favellæ* borne on the lateral ramuli, with a spreading, many-rayed involucre.

CERAMIUM *flaccidum*, *Harv. in Herb.*

HORMOCERAS *gracillimum*, *Kütz. in Linn. vol. xv. p. 733. Kütz. Phyc. Gen. p. 378.*

HAB. On muscle shells and on *Corallina officinalis* and other small Algæ, exposed at extreme low-water. Annual. September. Kilkee, coast of Clare, *W.H.H.* (1844). Mewstone, Plymouth, *Rev. W. S. Hore* and *Dr. Cocks*. Penzance, *Mr. Ralfs*. Probably common.

GEOR. DISTR. Mediterranean Sea. Atlantic coast of France.

DESCR. *Fronds* densely tufted, two or three inches long, much more slender than a human hair, exceedingly flaccid and tender, irregularly dichotomous or somewhat alternately divided; the principal stem and branches of nearly equal diameter from their base to the extremity, the forkings distant. *Branches* furnished at intervals of one or two joints with minute, alternate, dichotomous, flabelliform ramuli, a line or two in length, obovate in outline and level topped. *Apices* incurved, but not strongly hooked. *Articulations* colourless; those of the lower part of the stem many times longer than broad, of the branches gradually shorter; and in the lateral dichotomous ramuli much shorter than their breadth, the terminal ones appearing like mere striæ. *Dissepiments* opaque, purple, swollen. *Favellæ* either on lateral ramuli, or on truncated branches, binate, globose, surrounded by elongated, forked involucral ramuli. *Tetraspores*, I have not seen. *Substance* exceedingly tender and gelatinous, closely adhering to paper in drying. *Colour*, a dark, reddish purple.

I first met with this plant in the autumn of 1844, at Kilkee,

on the west coast of Ireland. It covered a very large surface of rock, growing almost to the exclusion of every other species, both in places left bare at low water, and in the small tide-pools. In both situations it seemed to prefer the stunted fronds of *Corallina officinalis* for its habitat. It has a softer and more gelatinous substance than any British *Ceramium*, and this character, with its extreme tenuity, and the minute, fastigate lateral branchlets, readily distinguish it from any of the section of the genus to which it belongs.

On communicating specimens to Professor Kützinger, he informed me that they were identical with his *Hormoceras gracillimum* described four years previously. There can therefore be no confusion of synonyms in our adopting the species of the German author, whose specimens came from the Adriatic.

C. gracillimum is the smallest and most slender of our British *Ceramia*. So slender are its threads, so flaccid, and so densely crowded together, that it is almost impossible to display them properly on paper. They almost invariably become entangled together, and once this has occurred, it is in vain to attempt their disentanglement.

Fig. 1. Tuft of CERAMIUM GRACILLIMUM, growing on Corallina officinalis; *the natural size*. 2. A branch. 3. A ramulus. 4. Pedunculated Favella with its involucre;—*all more or less highly magnified*.



PLATE CCVII.

CLADOPHORA UNCIALIS, *Harv.*

GEN. CHAR. *Filaments* green, jointed, uniform, branched. *Fruit* aggregated granules or zoospores, contained in the joints, having at some period, a proper ciliary motion. CLADOPHORA (*Kütz.*)—from κλαδος, a *branch*, and φεω, to *bear*.

CLADOPHORA *uncialis*: tufts very short, spongy, simple below, above divided into numerous fastigiate, woolly segments; filaments flexuous, sparingly branched, densely interwoven; ramuli distant, secund, long, patent, or incurved; articulations about twice as long as broad.

SPONGIOMORPHA *uncialis*, *Kütz. Phyc. Gen.* p. 273.

CONFERVA *uncialis*, *Fl. Dan.* t. 771. fig. 1. *Lyngb. Hyd. Dan.* p. 160. t. 56. *Ag. Syst.* p. 111. *Harv. in Hook. Journ. Bot.* vol. i. p. 304. *Wyatt, Alg. Danm.* no. 146. *Harv. Man.* p. 138.

HAB. On rocks, near low water mark. Annual. May. Torbay, *Mrs. Griffiths*. Falmouth bay, *Miss Warren*. St. Michael's Mount and Aberystwith, *Mr. Ralfs*. Jersey, *Miss White*. Newcastle, Downshire, *Mr. W. Thompson*. Rathlin, Antrim, *Mr. D. Moore*. Rocks beyond Kingstown, *Miss Ball*. Malbay and Balbriggan, *W. H. H. Malahide*, *Mr. M'Calla*. Orkney, *Messrs. Thomas and M'Bain*.

GEOGR. DISTR. Shores of Northern Europe.

DESCR. *Filaments* very slender, an inch or two in length, densely aggregated into spongy or rope-like tufts, forming a more or less definite compound frond, which is simple below and divided into several branches of about equal length, whose tops, therefore, standing on a level, produce a globular tuft. As the plant advances in age, the branches become less regular, and the tufts assume a woolly or shaggy aspect. *Filaments* irregularly and distantly branched, interwoven, and connected together by root-like fibres, which issue from the sides of the branches, take a downward direction, and coil round neighbouring filaments; *branches* curved, secund, simple, or with a few erect or subpatent, simple ramuli. *Articulations* pretty uniform, generally about twice as long as broad, filled with a fluid endochrome. *Colour*, a vivid green, discharged in fresh water, and very much faded in drying. *Substance* membranaceous, adhering to paper.

This plant was added to the British Flora by Mrs. Griffiths in the year 1833, and has been found abundantly in several places. It more nearly resembles *C. lanosa* than any other of our native species, and sometimes cannot be readily distinguished without a close examination; but it forms much more dense and spongy tufts, which finally become more intricately interwoven together;

and the apices are seldom so distinctly fastigate as in that species. The habitat in which *C. uncialis* occurs, affords an additional clue. It usually frequents rocky places, growing on the rock itself, or among the thin coating of sand which covers it, in places close to the edge of low-water mark. *C. lanosa*, on the contrary, is almost always found as a parasite on other Algæ; or else attached to pieces of wood, and to the leaves of *Zostera*. To *C. arcta*, our *C. uncialis* has much resemblance; but is a much smaller plant, with very much more slender filaments.

The root-like fibres, by which the filaments are connected together, are common to the three species: and if these roots be considered a character of sufficient importance to define a *genus*, Kützinger's *Spongiomorpha*, founded on the present plant, ought to include the three.

Fig. 1. Tufts of CLADOPHORA UNCIALIS:—*of the natural size.* 2. Filaments bundled together:—*moderately magnified.* 3. Portion of a filament:—*highly magnified.*

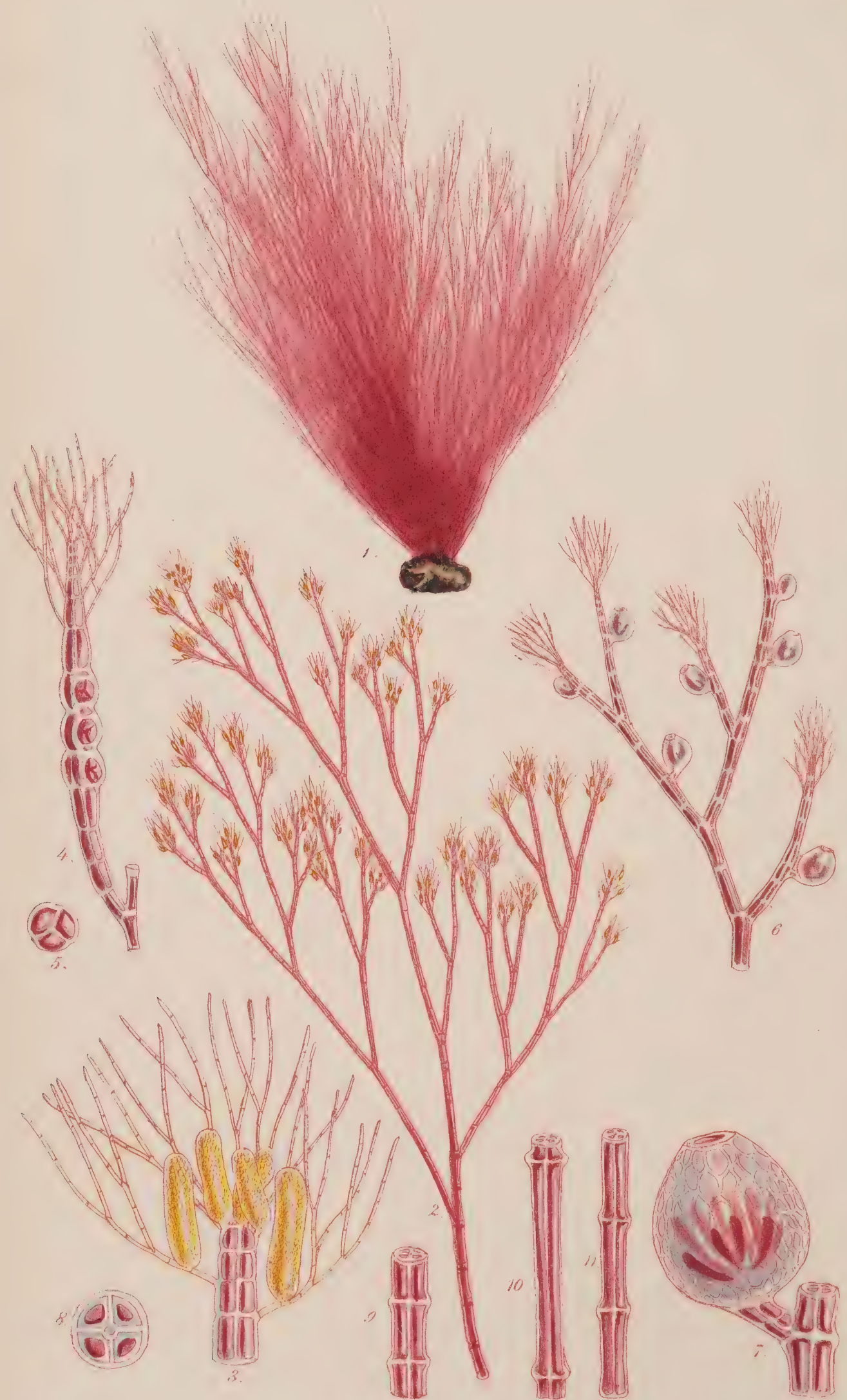


PLATE CCVIII.

POLYSIPHONIA FIBRATA, *Harv.*

GEN. CHAR. *Frond* filamentous, partially or generally articulate; joints longitudinally striate, composed of numerous radiating cells or tubes, disposed round a central cavity. *Fructification* twofold, on different individuals; 1, ovate capsules (*ceramidia*), furnished with a terminal pore, and containing a tuft of pear-shaped spores; 2, *tetraspores*, imbedded in swollen branchlets. POLYSIPHONIA (*Grev.*) — from *πολυς*, many, and *σιφων*, a tube.

POLYSIPHONIA *fibrata*; stems setaceous below, much attenuated upwards, flaccid, gelatinous, simple or alternately branched, bearing at greater or less distances, dichotomously divided, more or less pencilled ramuli, whose tips are fibrilliferous; axils patent; articulations bistriate, variable in length, those in the principal branches four to six times longer than broad; siphons four, surrounding a minute central cavity; capsules ovate, usually pedunculate.

POLYSIPHONIA *fibrata*, *Harv. in Hook. Br. Fl.* vol. ii. p. 329. *Harv. in Mack. Fl. Hib.* part 3, p. 206. *Harv. Man.* p. 93. *Wyatt, Alg. Danm.* no. 39. *Kütz. Phyc. Gen.* p. 426. *Endl. 3rd Suppl.* p. 45.

HUTCHINSIA *allochroa* β. *fibrata*, *Ag. Syst.* p. 154.

CONFERVA *fibrata*, *Dillw. Conf. Syn.* p. 84. t. G.

HAB. On rocks, muscle shells, &c., near low water mark, either in tide-pools or exposed places. Annual. Summer and Autumn. Frequent on the British coasts.

GEOGR. DISTR. Atlantic shores of Europe.

DESCR. *Root*, a mass of branched and matted fibres. *Fronde*s very densely tufted, from two to six or eight inches in length, as thick as hogs' bristle at the base, gradually attenuated upwards to a capillary or byssoid fineness, irregularly dichotomous or alternately branched; branches more or less divided, either indefinitely decompound or bearing along their divisions lateral multifid ramuli, which sometimes are dense and pencilled, in other specimens more lax and simpler. *Articulations* visible throughout the whole plant; twice as long as broad below; six or eight times as long in the middle of the stem; three or four times in the upper branches; and scarcely twice as long as broad in the ramuli:—marked with two wide, coloured tubes, separated by narrow pellucid spaces. *Siphons* four, containing coloured bags, and surrounding a minute central cavity. *Apices* of the branches and ramuli terminating in a tuft of byssoid, dichotomous fibres. *Ceramidia* ovate, with a wide mouth, pedunculate, abundantly scattered over the upper branches, containing a tuft of pear-shaped spores. *Tetraspores* small, in distorted ramuli. *Antheridia* oblong, obtuse, yellow, growing from the apical fibres and clustered round the tips of the branches. *Colour*,

a dark red-brown, sometimes becoming purple in drying; the colouring matter soon given out in fresh water, to which it imparts a rosy hue. *Substance* very tender and gelatinous, soon decomposing. *Odour* offensive.

The species here figured, originally defined by Mr. Dillwyn in the supplement to his work on the British Confervæ, appears to be well understood by most British botanists, who are sufficiently familiar with its characters from the excellent specimens published by Mrs. Wyatt. It is pretty generally dispersed on the British coasts, and must be regarded as one of our commonest species of *Polysiphonia*. I am not clear, however, that it is equally well understood on the continent, and have reason to believe that it is known in different places under several different names; but in the present state of our knowledge of the *Polysiphoniæ*, I have not ventured to bring together any supposed synonymys. The genus is a very extensive one—and its species put on, at different ages, a great variety of forms. These, if gathered isolated one from another, or by persons who are more desirous of recording novelties than of tracing out the true relations of vegetable forms, may often be made to pass for new species; while they would, if carefully watched in their place of growth, soon put on the peculiar characteristics of the type to which they belong. I know scarcely any genus in which more false species have been founded on imperfect specimens than *Polysiphonia*:—and this is saying much in the present day, in which the practice has been so largely indulged in, in almost every department of botany;—but especially among cellular plants.

The dichotomous fibres which terminate the branches of our *P. fibrata*, and which have given it its name, are by no means peculiar to it; but are equally characteristic of the young state of most, if not all, the species of the genus. On some they are found more abundant and more fully developed than on others, and in the present plant this is remarkably the case. It is to these fibres the *antheridia* are attached, which on *P. fibrata* are frequently in great abundance, crowning every branchlet with a tuft of golden fruit.

Fig. 1. Tuft of *POLYSIPHONIA FIBRATA*:—*the natural size*. 2. A branch bearing antheridia. 3. Apical fibres and antheridia. 4. A ramulus with imbedded tetraspores. 5. Tetraspore. 6. Ramuli with ceramidia. 7. A ceramidium. 8. Transverse section of the frond. 9. Articulations from the lower part of the stem: 10, from the middle: 11, from the upper part:—*all more or less magnified*.



PLATE CCIX.

POLYSIPHONIA VIOLACEA, *Grev.*

GEN. CHAR. *Frond* filamentous, partially or generally articulate; joints longitudinally striate, composed of numerous radiating cells or tubes, disposed round a central cavity. *Fructification* two-fold, on different individuals; 1, ovate *capsules* (*ceramidia*), furnished with a terminal pore and containing a tuft of pear-shaped spores; 2, *tetraspores*, imbedded in swollen branchlets. POLYSIPHONIA (*Grev.*) — from *πολυς*, *many*, and *σιφων*, a *tube*.

POLYSIPHONIA *violacea*; brownish red or purple; stem inarticulate, marked with irregular cells, rather robust, alternately branched; branches quadrifarious, decomposed, bushy or feathery, the ultimate ramuli exceedingly slender, alternately multifid, fibrilliferous; articulations of the ramuli bi-striate, two to four times longer than broad; siphons four; capsules ovate, pedicellate or sessile; tetraspores in swollen, sub-moniliform ramuli.

POLYSIPHONIA *violacea*, *Grev.*—*Wyatt, Alg. Danm.* no. 176. *Harv. Man.* p. 92 (not of *Harv. in Brit. Fl.* vol. ii. p. 332). *Kütz. Phyc. Gen.* p. 421. (no. 34) and p. 426 (no. 74). *Endl. 3rd Suppl.* p. 46.

HUTCHINSIA *violacea*, *Ag. Syn.* p. 54. *Lyngb. Hyd. Dan.* p. 112. t. 35 (*quoad partem*) f. B. *Ag. Syst.* p. 150. *Ag. Sp. Alg.* vol. ii. p. 76.

HAB. On rocks and stones, and on the smaller Algæ, near low water mark. Annual. May and June. Not uncommon. Torbay, *Mrs. Griffiths*. Salcombe, *Mrs. Wyatt*. Falmouth Harbour, *Miss Warren*. Most abundant at Carnarvon, *Mr. Ralfs*. Beggar's Island, Plymouth, *Mr. Rohloff*. Belfast Lough, *Dr. Drummond*. Roundstone, *Mr. M'Calla*. Howth, *Miss Gower*. Ferriter's Cove, Kerry, *Mr. Andrews*.

GEOGR. DISTR. Shores of Northern Europe generally.

DESCR. *Root*, a small disc. *Fronds* from six to ten inches long or more, with a principal stem which varies in diameter from the thickness of a hog's bristle to twice that thickness, and is divided in an irregularly alternate manner. *Branches* quadrifarious, repeatedly compounded, till there results a bushy or feathery, closely branched frond, each division of which becomes more and more slender and flaccid, and the whole at length terminates in an abundance of slender capillary ramuli, which are long and subsimple, sparingly branched near the top, and generally terminated by a tuft of byssoïd fibres. *Stem* and principal branches inarticulate, their siphons being coated externally with a thick stratum of irregular cells. *Ramuli* articulate; the articulations two-tubed, the lower ones four times, the upper twice as long as broad. *Ceramidia* ovate, abundant on the ramuli, frequently pedunculate. *Tetraspores* imbedded in swollen ramuli, roundish. *Colour*, brown red, more or less purple, and frequently assuming a fine

purple shade on drying, after immersion in fresh water. *Substance* very tender and soft, cartilaginous in the stem and branches, gelatinous in the ramuli, closely adhering to paper.

A very beautiful species, in many respects resembling *P. fibrata*, especially in the appearance that small portions present to the microscope; but this is a much larger and finer growing plant, and readily and clearly distinguished by the opaque stem, coated with short, irregular cells. In some specimens the byssoid ramuli are much developed, and of a beautiful violet colour, especially when dried; in others they are far shorter, and the frond has a more bushy appearance. In a young state the tips are found clothed with fibres, but these are rarely seen in the more advanced stages of growth.

From *P. Brodiaei*, to which luxuriant specimens bear much resemblance, *P. violacea* is at once known by the fewer number of tubes in the stem; the siphons in that species being seven in number, whereas in this there are but four.

The species called *P. violacea* in the British Flora, on the authority of Carmichael, is very different from the present; but so near *P. nigrescens* in its essential characters that I am now disposed to regard it as merely a variety of that species. I had at one time kept it distinct under the name of *purpurascens*. Every one acquainted with *P. nigrescens* must know that it puts on a great variety of shapes, and the state formerly called *violacea* differs from the usual forms in being of a brighter and more purple colour, with greater delicacy of ramification.

Our present *P. violacea* was first detected as British by Mrs. Griffiths, and ascertained to be identical with the plant of continental authors by Professor J. Agardh, who inspected the specimens published in the early copies of Mrs. Wyatt's books. It has been found on most of our coasts, and is probably distributed round the shores of the British Isles.

Fig. 1. POLYSIPHONIA VIOLACEA:—*the natural size.* 2. Ramuli with *tetraspores*. 3. Ramulus removed. 4. A tetraspore. 5. Fibrilliferous apex. 6. Ramuli with *capsules*. 7. A capsule. 8. Portion of the stem, to show its surface cells. 9. Transverse section of the stem, to show the siphons.



PLATE CCX.

CHYLOCLADIA PARVULA, *Hook.*

GEN. CHAR. *Frond* (at least the branches) tubular, constricted at regular intervals, and divided by internal diaphragms into joints, filled with a watery juice, and traversed by a few longitudinal filaments; periphery composed of small, polygonal cells. *Fructification* of two kinds, on distinct individuals; 1, spherical, ovate, or conical *capsules* (*ceramidia*) containing a tuft of wedge-shaped spores on a central placenta; 2, tripartite *tetraspores*, immersed in the smaller branches, near their apices. CHYLOCLADIA (*Grev.*) — from *χυλος*, *juice*, and *κλαδος*, a *branch*.

CHYLOCLADIA *parvula*; frond subgelatinous, slender, bushy, irregularly branched; ramuli scattered; branches constricted at intervals of (nearly) equal length and breadth; *ceramidia* conical, with a prominent orifice.

CHYLOCLADIA *parvula*, *Hook. Br. Fl.* vol. ii. p. 298. *Wyatt, Alg. Danm.* n. 72. *Harv. in Mack. Fl. Hib.* part 3. p. 199. *Harv. Man.* p. 72. *J. Ag. Alg. Medit.* p. 111.

GASTRIDIDIUM *parvulum*, *Grev. Alg. Brit.* p. 119.

LOMENTARIA *parvula*, *Zanard. Syn. Alg. Adr.* p. 99. *Mont. Pol. Sud. Crypt.* p. 123. *Endl. 3rd Suppl.* p. 43. *Kütz. Phyc. Gen.* p. 331.

CHONDRIA *parvula*, *Ag. Syst. Alg.* p. 207.

FUCUS *kaliformis*, *var. γ. nanus*, *Turn. Hist.* vol. i. p. 61.

HAB. Parasitical on the smaller Algæ, in tide-pools, near low water mark.

GEOGR. DISTR. Atlantic shores of Southern Europe and North America. Mediterranean Sea.

DESCR. *Root* composed of branched and matted fibres. *Fronds* three or four inches long, very densely crowded together, forming globular, intricate, bushy tufts, whose branches spread in all directions. *Stem* subsimple or irregularly forked, sometimes much divided, furnished with scattered, more or less crowded, alternate or opposite, occasionally whorled branches, as long as itself and very patent. *Branches* curved, more or less divided, and set with numerous scattered, patent or horizontal, obtuse ramuli, of nearly equal diameter with the parts they spring from. *Articulations* of the stem and main branches of uncertain length, and occasionally imperfectly defined; those of the branches and ramuli pretty constantly as long as broad, or once and a half as long, contracted at the dissepiments. *Ceramidia* prominent, sessile on the branches, ovate or conical, with a prominent orifice, and containing a dense and very darkly coloured mass of tufted, obconical spores. *Tetraspores* minute, triparted, abundantly scattered through the lesser branches and ramuli. *Colour*, a pinky or dull red, changing in fresh

water ; but when the plant grows in a sunny situation the whole frond, except the tips and the masses of spores, becomes of a greenish yellow. *Substance* gelatinous and tender, closely adhering to paper in drying.

This plant, in many of its characters, resembles the smaller specimens of *C. kaliformis*, of which it was formerly considered to be merely a dwarf variety. But it may generally be known from all states of that species by its peculiarly bushy, dense habit, and the alternate disposition of its branches and ramuli ; and when found in fructification the two are clearly distinguished by the different form of the capsular fruit. The ceramidia of *C. kaliformis* are hemispherical ; those of *C. parvula* are of much larger size, less abundant, and distinctly conical, with a much less evident hyaline border. In the present species also, the articulations of the branches are shorter and more equal than in *C. kaliformis* ; and those of the main stems never so much distended, nor of so great a proportionate length.

Chylocladia parvula is found on most of our coasts, and appears frequent along the Atlantic and Mediterranean shores of Europe. Along the eastern shore of North America it would seem to be particularly abundant, as it occurs in almost every parcel of Algæ which I have received from that country. The American specimens agree in all essential particulars with the European ; but some are much more slender, while others are more robust than the generality of British individuals. But there is quite as much difference observable among the latter as in any of the American forms.

A species found at New Zealand (*C. affinis*, Hook. et Harv.) seems almost intermediate between *C. kaliformis* and *C. parvula*, having much of the ramification of one, with the fructification of the other ; but it is sufficiently distinct from both.

Fig. 1. CHYLOCLADIA PARVULA :—*the natural size.* 2. Branchlets with ceramidia. 3. Section of a *ceramidium*. 4. Spores from the same. 5. Branchlets with tetraspores. 6. A tetraspore :—*all more or less magnified.*



PLATE CCXI.

PORPHYRA VULGARIS, *Ag.*

GEN. CHAR. *Frond* delicately membranaceous, flat, purple. *Fructification*, granules, arranged in fours, scattered over the whole frond; also "scattered sori of oval spores." PORPHYRA (*Ag.*),—from πορφυρος, *purple*.

PORPHYRA *vulgaris*; frond simple, lanceolate, entire, the margin more or less waved.

PORPHYRA *vulgaris*, *Ag. Aufz.* p. 18. *Grev. Alg. Brit.* p. 169. *Hook. Br. Fl.* vol. ii. p. 310. *Wyatt, Alg. Danm.* n. 32. *Harv. in Mack. Fl. Hib.* part 3. p. 241. *Harv. Man.* p. 169. *Hook. fil. Fl. Antarct.* vol. ii. p. 500. *Kütz. Phyc. Gen.* p. 382. *Endl. 3rd. Supp.* p. 19.

PORPHYRA *purpurea*, *Ag. Syst. Alg.* p. 191.

PORPHYRA *linearis*, *Grev. Alg. Brit.* p. 170. t. 18. *Hook. Br. Fl.* vol. ii. p. 310. *Harv. in Mack. Fl. Hib.* part 3. p. 241. *Harv. Man.* p. 170. *Wyatt, Alg. Danm.* n. 163. *Endl. 3rd. Supp.* p. 19,

ULVA *purpurea*, *Roth, Cat. Bot.* vol. i. p. 209. t. 6. *Lyngb. Hyd. Dan.* p. 29. *Ag. Sp. Alg.* vol. i. p. 405.

HAB. On rocks and stones between tide-marks. Annual. Nearly throughout the year. Abundant on the British shores.

GEOGR. DISTR. Throughout the Atlantic Ocean, from the Færoe Islands to Cape Horn. Kerguelen's Land.

DESCR. *Root*, a minute disc. *Fronds* from one to two feet long, and from one or two lines to two or three inches in width, perfectly simple, lanceolate or linear, tapering much at the extremity, at first ovate at the base, afterwards more or less cordate, rising from a very minute linear stipe. In the narrower varieties the margin is nearly flat, and even; in the broader it is very much waved, but scarcely sinuous. *Fructifications* elliptical dark-purple granules, arranged in fours, dispersed through all the cells of the frond; and also "irregular scattered sori of larger, ovate granules, mostly situate near the base." (*Grev.*) *Substance* very thin and membranaceous, very glossy, shrinking much in drying and only imperfectly adhering to paper. *Structure* cellular; the frond composed of a double stratum of quadrate cells. *Colour* (owing to fructification) a more or less vivid purple.

This is distinguished from *P. laciniata*, already figured at our Plate XCII., by being perfectly simple at all ages, instead of being irregularly cloven; and by the much greater length of the frond in proportion to its breadth. Both are equally common, and widely dispersed over the world, and both indifferently may be

used in the preparation of marine-sauce or *Laver*. The subject of our present plate is the more beautiful of the two, being commonly of a much brighter colour than its congener, but like it, the brilliancy varies according to the forwardness of the fructification.

It will be seen, by reference to the plate, and synonyms quoted, that I propose to reduce the *P. linearis* of British authors to its original place as a narrow variety of *P. vulgaris*. It was originally separated by Dr. Greville in his *Algæ Britannicæ*, and this separation has been adopted in subsequent British works, though in the Manual I have expressed doubts of the validity of the supposed new species. When gathered in early winter, as in the month of November, it appears sufficiently distinct. Wide spaces of rock will be found clothed with narrow purple ribbons, as flat and free from undulations and as ovate at the base, with as distinct a stipes as are represented in figures 2 and 3. But two or three months later a considerable change will have taken place in the plants, their margins will be more uneven and their bases less ovate; and by the end of spring, it will be difficult to trace in the plants which will then cover the rocks the slender ribbons of winter. I admit that there are localities, very near high-water mark, where the frond never attains any great length or breadth, and therefore remains more true to the name *linearis*, but this stunted growth is clearly referable to deficient nourishment. Where the plant grows in deeper water the fronds gradually develop into the broad state represented at fig. 1. This figure represents but a small specimen; the frond is often two feet in length.

I am not acquainted with *P. amethystea*, Kütz., founded on a specimen collected by Mr. Shuttleworth on the Irish coast. Can it be merely a state of *P. vulgaris*?

Fig. 1. PORPHYRA VULGARIS. 2. Narrow state of the same, the *P. linearis* of authors;—both of the natural size. 3. Base of young frond. 4. Portion of surface, in fruit. 5. Vertical section of frond. 6. Tetraspore.

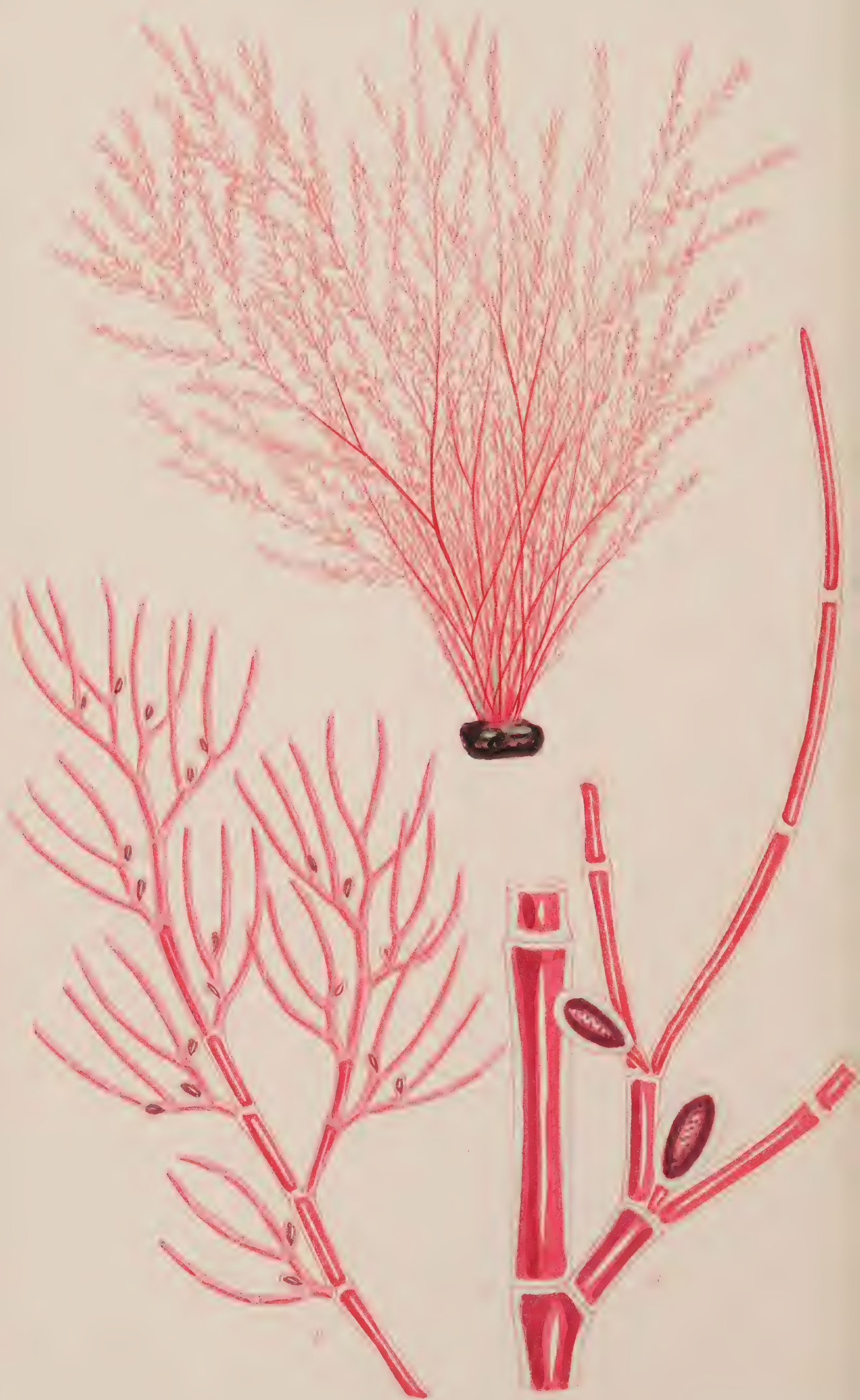


PLATE CCXII.

CALLITHAMNION PEDICELLATUM, *Ag.*

GEN. CHAR. *Fronde* rosy or brownish-red, filamentous, stem either opaque and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds, on distinct plants; 1, external tetraspores, scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like receptacles (*favellæ*), seated on the main branches, and containing numerous, angular spores. CALLITHAMNION (*Lyngb.*),—from *καλος*, *beautiful*, and *θαμνιον*, *a little shrub*.

CALLITHAMNION *pedicellatum*; stems setaceous, pellucid, jointed, loosely and irregularly divided; branches furnished with short, alternate, sparingly dichotomous ramuli; apices very obtuse; articulations variable, mostly very long; tetraspores(?) solitary, elliptical or pear-shaped, axillary, stalked.

CALLITHAMNION *pedicellatum*, *Ag. Sp. Alg.* vol. ii. p. 174. *Harv. in Hook. Fl. Brit.* vol. ii. p. 347. *Harv. in Mack. Fl. Hib.* part 3. p. 217. *Harv. Man.* p. 114. *Wyatt, Alg. Damn.* no. 94. *J. Ag. Alg. Medit.* p. 73. *Kütz. Phyc. Gen.* p. 371. *Endl. 3rd. Supp.* p. 34.

CALLITHAMNION *clavatum*, *Ag. Sp. Alg.* vol. ii. p. 180. *J. Ag. Alg. Medit.* p. 73. *Kütz. Phyc. Gen.* p. 371. *Mont. An. Sc. Nat.* 1839. p. 166. *Endl. 3rd, Supp.* p. 34.

CALLITHAMNION *Perreymondii*, *Duby. Mem.* vol. ii. t. 4. f. 5.

CALLITHAMNION *botryticum*, *De Not.* (fide *Lenorm.*)

GRIFFITHSIA *irregularis*, *Kütz. Actien*, 1836.

CERAMIUM *pedicellatum*, *Ag. Syst.* p. 137.

CERAMIUM *clavægerum*, *Bonn. Hyd. loc. in An. Mus. Par.* 1825. p. 90.

CONFERVA *pedicellata*, *E. Bot.* t. 1817. *Dillw. Conf.* t. 108.

HAB. On rocks and wood-work, near low-water mark, mostly in deep rock-pools; sometimes dredged in from 4–7 fathoms. Rather rare, but found all round the coast. Annual. Summer. Brighton, *Mr. Borrer*. Torbay &c., *Mrs. Griffiths*. Sidmouth, *Miss Cutler*. Falmouth Bay, *Miss Warren*. Salcombe, Carnarvon, and Milford Harbour, *Mr. Ralfs*. Jersey, *Miss White* and *Miss Turner*. Bantry Bay, *Miss Hutchins*. Malbay, Valentia, and Wicklow, *W.H.H.* Portaferry and Bangor, Belfast Bay, *Mr. W. Thompson*. Roundstone, *Mr. M'Calla*. Ferriter's Cove, *Mr. W. Andrews*. Howth, *Miss Gower*. Orkney, *Rev. J. Pollexfen*. Dredged in Calf Sound, in seven fathoms, *Messrs. Thomas and M' Bain*. Saltcoats and Ardrossan (on the pier), *Rev. D. Landsborough*.

GEOGR. DISTR. Atlantic shores of France. Mediterranean Sea.

DESCR. *Root* discoid, or somewhat fibrous. *Fronde*s densely tufted, from two to six or eight inches high, as thick as hogs' bristles, irregularly divided in a manner between alternate and dichotomous; branches sometimes nearly simple, long and virgate, sometimes repeatedly branched, and somewhat flabellate, more or less fastigate, seldom quite naked, generally furnished at each joint with short, forked, or twice or thrice dichotomous, alternate ramuli. Ultimate divisions of the forked ramuli often incurved, cylindrical,

of several joints, very obtuse. *Stems* articulated at the base, the articulations free of veins, with a wide limb and a more or less contracted endochrome, the dissepiments pellucid. *Articulations* variable in different specimens, sometimes only three or four times longer than broad, but more commonly ten or twelve times. *Tetraspores* (?) elliptical or pear-shaped, dark-coloured, with a wide border, and containing a dense, undivided mass of endochrome. These bodies are borne on short pedicels, consisting of a single cell, in the axils of the ultimate ramuli; each fructification being formed out of the central *bud* of a trifid branch, and thus cymose. *Favellæ* unknown. *Substance*, when freshly gathered, somewhat crisp; soon becoming flaccid. *Colour*, a clear pinky red, rapidly changing in fresh water, and becoming brownish in drying, often staining the paper brown. It closely adheres to paper in drying.

Originally discovered on the Sussex coast, by Mr. Borrer, and long considered a rarity, this beautiful plant has now been found to grow in so many places that I might perhaps have spared myself the transcription of the various habitats mentioned above, and substituted the statement that it is not very uncommon, and is generally distributed round the British coasts. I have not seen any specimens from the east of England, and it is certainly rare in the north, and in Scotland. On the south coast of England, and south and west of Ireland it is by no means rare, and the individual specimens are often of large size. It is common on the shores of France, and in the Mediterranean, where its different varieties, as I regard them, are ennobled to the rank of species by most continental botanists.

M. Montagne in a memoir on *Cal. clavatum*, published in the Annales des Sciences Naturelles, refers the *Conf. pedicellata* of Dillwyn to that species, retaining, of course, the name *pedicellatum* to the plant described in Eng. Botany, and which he regards as a different species. I possess fragments of Mr. Borrer's original specimen figured in English Botany; and have examined those collected by Miss Hutchins from which Dillwyn's plate, copied from a beautiful drawing by that lady, was engraved; and having compared these together, and contrasted them with a great number of specimens from various localities, I am not disposed to alter the opinion which I formerly expressed of their identity. M. Montagne is, no doubt, correct in referring Dillwyn's plant to the *C. clavatum* of Agardh.

Among the many forms which this plant puts on, I possess one gathered by Mr. Ralfs at Salcombe, which is remarkable for extremely squarrose ramuli and spreading branches.

Fig. 1. CALLITHAMNION PEDICELLATUM; tuft:— of the natural size. 2. Apex of a branch, with ramuli. 3. Portion of branch, ramulus and fruit:—both magnified.

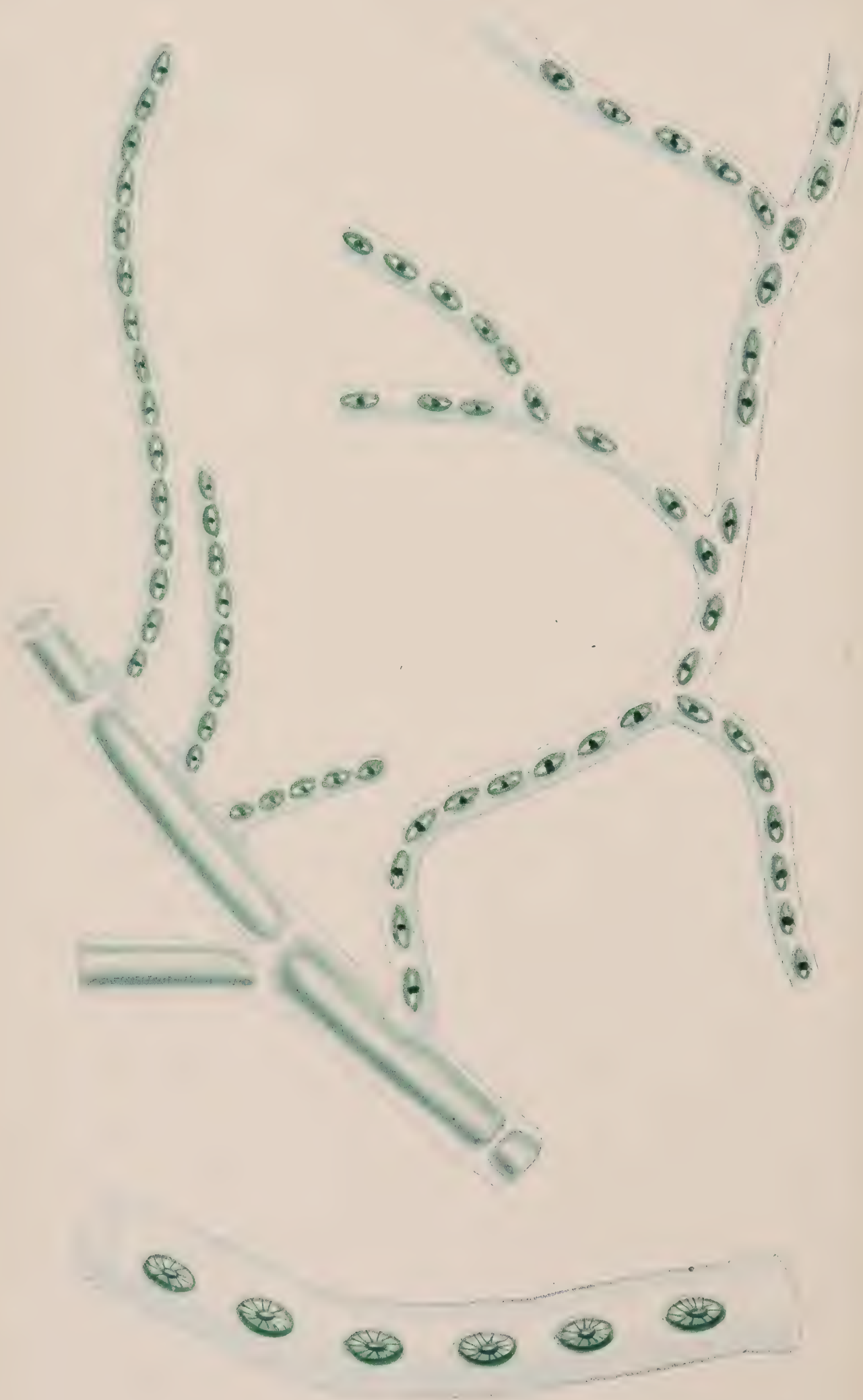


PLATE CCXIII.

HORMOSPORA RAMOSA, *Thw.*

GEN. CHAR. *Filaments* gelatinous, confervoid, each enclosing a linear series of oval or spherical cells. *Endochrome* green. *Fructification*: cells of the filaments enlarged and become converted into spores.

HORMOSPORA (*Brébisson*),—from ὄρμος, a *necklace*, and σπορά, a *seed*.

HORMOSPORA *ramosa*; filaments branched; endochrome radiated.

HAB. Growing attached to the filaments of *Cladophora fracta* in a salt-water lake near Wareham, Dorsetshire. August and September. *Rev. W. Smith.*

DESCR. *Filaments* gelatinous, irregularly branched. *Cells* at first subcylindrical and closely coherent; subsequently becoming ovate and distinct. *Endochrome* pale green, radiating from a central nucleus. Filaments at length resolved into separate spores, each of which is surrounded by a considerable amount of gelatine.

This pretty species bears a considerable resemblance to *Hormospora mutabilis*, Brébisson; it differs, however, in its filaments being branched instead of being simple as in that species. In *H. mutabilis* the young cells are described as being subspherical, and the endochrome is stated to be lamellose; whereas in the present species the endochrome is radiated, and the immature cells are nearly cylindrical. *H. mutabilis* occurs in fresh-water ponds; whilst this inhabits a salt-water lake, to which the sea has access occasionally.

The filaments of *H. ramosa* when young are not unlike those of a *Sphæroplea*, between which genus and the *Palmelleæ*, *Hormospora* would seem to form a connecting link.

[I am indebted to my friend G. H. K. Thwaites, Esq., of Bristol, for the drawing and description here given. The genus *Hormospora* was first proposed by M. Brébisson in the year 1840, and a further account accompanied by figures of two species, both natives of stagnant fresh water, has been given by that accomplished naturalist, in the Annales des Sciences Naturelles for January, 1844. The species now described is the first yet

noticed in salt water. Though not actually a *marine* plant, it has as much claim to a place in this work as some others already introduced, and I have pleasure in introducing the genus to British botanists. I should mention that the *Hormospora mutabilis*, stated to have been found by Mr. M' Ivor, proves on a more careful examination to be an animal substance.—*W.H.H.*]

Fig. 1. Young and mature filaments of *HORMOSPORA RAMOSA*, growing upon *Cladophora fracta*. 2. Cells become converted into spores:—*all highly magnified (about 300 linear.)*



PLATE CCXIV.

GRIFFITHSIA CORALLINA, *Ag.*

GEN. CHAR. *Frond* rose-red, filamentous; filaments jointed throughout, mostly dichotomous; ramuli single tubed; dissepiments hyaline. *Fructification* of two kinds on distinct individuals; 1, *tetraspores* affixed to whorled involucre, ramuli; 2, gelatinous *receptacles* (*favellæ*), surrounded by an involucre, and containing a mass of minute, angular spores. GRIFFITHSIA (*Ag.*),—in honour of *Mrs. Griffiths*, the most distinguished of British Algologists.

GRIFFITHSIA *corallina*; filaments dichotomous, incrassated, gelatinous; axils patent; joints swollen upwards, pear-shaped, the ultimate ellipsoid; involucre sessile, those containing tetraspores whorled round the branch, those containing favellæ lateral.

GRIFFITHSIA *corallina*, *Ag. Syn.* p. 28. *Hook. Fl. Scot.* part 2. p. 84. *Ag. Syst.* p. 145. *Ag. Sp. Alg.* vol. ii. p. 127. *Harv. in Hook. Br. Fl.* vol. ii. p. 338. *Harv. in Mack. Fl. Hib.* part 3. p. 212. *Harv. Man.* p. 103. *Wyatt, Alg. Danm.* no. 89. *Kütz. Phyc. Gen.* p. 374. *Endl. 3rd. Supp.* p. 35.

CALLITHAMNION *corallinum*, *Lyngb. Hyd. Dan.* p. 126.

CONFERVA *corallina*, *Linn. Sp. Pl.* p. 1636. *Lightf. Scot.* p. 988. *With.* vol. iv. p. 136. *Mohr. Isl.* p. 250. *Roth. Cat. Bot.* vol. iii. p. 225. *Dillw. Conf.* t. 98. *E. Bot.* t. 1825.

CONFERVA *corallinoides*, *Linn. Sp. Pl.* ed. i. p. 1166. *Huds. Fl. Ang.* p. 598.

CONFERVA *geniculata*, *Ellis, in Phil. Trans.* vol. lvii. p. 425. t. 18. fig. F. f.

CONFERVA *marina gelatinosa*, *corallinæ instar geniculata crassior*, *Dill. Musc.* vol. xxxiii. t. 6. f. 36.

HAB. On rocks near low-water mark, generally in deep pools. Annual. Summer. Not uncommon on the British shores from Orkney to Cornwall.

GEOGR. DISTR. Atlantic and Mediterranean shores of Europe. Færoe Islands. Iceland. North America. Tasmania.

DESCR. *Root* discoid. *Fronds* tufted, from two to six or eight inches in length, thicker than hogs' bristles, repeatedly and pretty regularly dichotomous, fastigate; the lesser branches more irregular, often alternate, slenderer than the rest of the frond, and tapering to a point. *Axils* in the lower part of the frond very wide, in the upper more and more narrow. *Articulations* two to four times longer than broad, more or less swollen upwards, those near the base of the stems somewhat cylindrical, those of the medial portions regularly pear-shaped, narrow at their lower extremity, and very wide above; the uppermost elliptical, connected in moniliform strings. *Dissepiments* hyaline and, as well as the border of the articulation, broad. *Fructification*: 1, *tetraspores* densely clustered in whorls round the joints, and surrounded by an involucre of short ramuli, very unequal in size, small

and large growing from the same point, attenuated at the base into a slender stalk; *favellæ* two or three together, sessile at the apex of an articulation, lateral, occupying the place of a suppressed branch of the stem, surrounded by short ramuli; each containing numerous ellipsoid granules. *Colour* a fine rosy crimson, freely given out in fresh water. *Substance* gelatinous and lubricous, closely adhering to paper in drying. *Smell* strong and peculiarly disagreeable.

This is one of those beautiful and not very uncommon plants which can scarcely fail to attract the notice of the observer who has once made the marine flora his study. We consequently find it among the species which soonest attracted notice. It is one of the few marine *Confervæ* figured by Dillenius, and having a place in the early editions of Linnæus. The clear red of its glossy, beaded fronds is well expressed in the specific name *corallina*, bestowed on it from an early period.

Few of our *Ceramieæ* have a wider range than *Griffithsia corallina*. It is found in every part of the European waters from the shores of Iceland to those of Italy, and I have received magnificent specimens from the shores of Van Dieman's Land. These last are so much larger and stronger than the majority of British grown fronds, that I at one time considered them distinct, and described them under the name *G. flabelliformis*; but on comparing them afresh with a suite of specimens, and especially with some very fine ones from the West of Ireland, I find that the distinctions formerly insisted on cannot be maintained. A considerable difference in the amount of upward-swelling of the joints exists in different specimens. This character is generally more developed in the larger than in the small individuals.

Fig. 1. GRIFFITHSIA CORALLINA:—*of the natural size*. 2. Portion of a branch with tetraspore-involucres. 3. One of the involucres. 4. Tetraspores. 5. Portion of a branch with favellæ. 6. Favellæ, with involucral ramuli:—*all more or less magnified*.

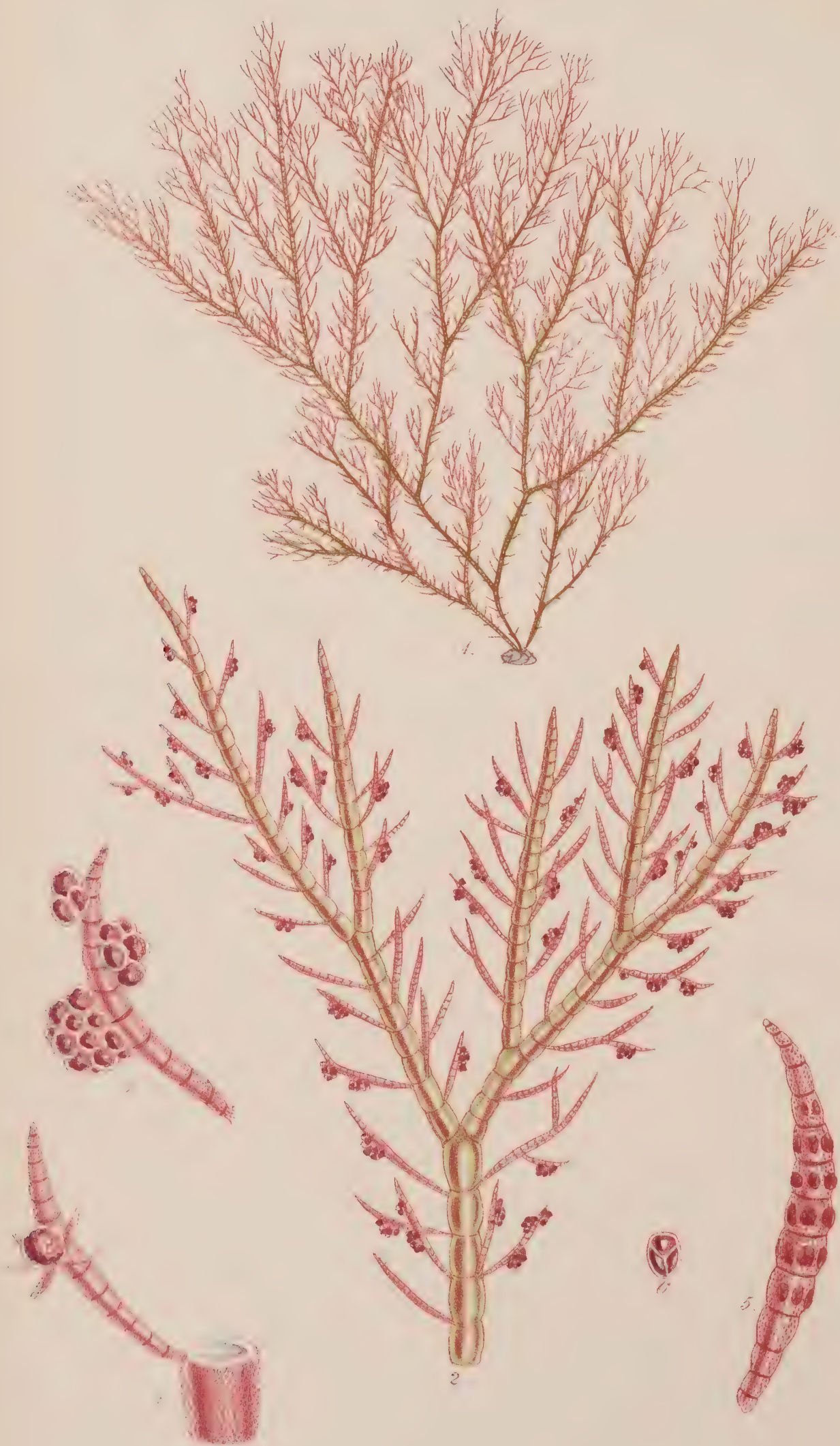


PLATE CCXV.

CERAMIUM BOTRYOCARPUM, *Griff.*

GEN. CHAR. *Fronde* filiform, one-tubed, articulated; the dissepiments coated with a stratum of coloured cellules, which sometimes extend over the surface of the articulation. *Fructification* of two kinds, on distinct individuals; 1, *tetraspores* either immersed in the ramuli, or more or less external; 2, sessile, roundish *receptacles* (*favellæ*), having a pellucid limbus, containing minute, angular spores, and subtended by one or more short, involucral ramuli. CERAMIUM (*Roth.*),—from *κεραμος*, a *pitcher*, but the fruit is not pitcher-shaped.

CERAMIUM *botryocarpum*; filaments crooked at the base, robust, gradually attenuated upwards, irregularly dichotomous, with numerous lateral, mostly simple ramuli, the apices straight; articulations coated with coloured cellules, unarmed, the lowermost twice as long as broad, the upper shorter than their breadth; dissepiments constricted; tetraspores immersed in the articulations, whorled; favellæ globose, of small size, heaped together in irregular clusters, borne on the lateral branchlets, destitute of involucral ramuli.

CERAMIUM *botryocarpum*, *Griff. in Herb.*—*Harv. Phyc. Gen.* in list of species, vol. i. pl. xi.

HAB. On rocks and Algæ, between tide-marks. Annual. Summer. Discovered on Preston rocks, Torquay, by *Miss Amelia E. Griffiths*, (1844.) Ardrossan, *Rev. D. Landsborough*.

GEOGR. DISTR. British Islands.

DESCR. *Root* scutate, with imperfect fibres. *Stems* sharply hooked or curved at the base (not well shown in figure), thicker than hogs' bristles, gradually attenuated upwards, three to five inches long, several times branched in a more or less regular dichotomous manner, the branches erect, with sharp and narrow axillæ, the apices sometimes level-topped, sometimes of unequal length, straight, not hooked inwards. The stem and main branches are very generally clothed with short, densely and irregularly inserted, simple or rarely forked, subulate or fusiform ramuli, two or three lines in length, and tapering to both extremities, much more slender than the parts from which they spring, but otherwise of similar structure. *Articulations* coated with a stratum of minute, coloured cells, those of the lower part of the stem twice as long as broad, those of the upper about equalling their breadth; dissepiments opaque, constricted. *Fructification*; 1, *tetraspores* dark purple, several in the same joint, arranged transversely, immersed, very slightly prominent. 2, *favellæ* small, round, heaped together like clusters of grapes, irregularly placed on the sides of the lateral ramuli, destitute of involucre. These are commonly produced in great profusion; but I have occasionally observed solitary favellæ, furnished with an invo-

lucre, as represented at fig. 4. *Colour*, when in perfection, a purplish red but very frequently faded into various shades of brownish and greenish yellow. *Substance* cartilaginous and firm, rather rigid, adhering, but not strongly, to paper in drying.

By comparing the figure and specific character of this plant with those of *C. rubrum* (Plate CLXXXI.), it will be seen that *C. botryocarpum* is very closely allied indeed to that species: nor should I feel disposed, acting on my own judgment, to consider it as more than a curious state, or variety, with an anomalous fruit. Mrs. Griffiths is, however, of a different opinion, and so are Professor Kützing and other botanists, to whom specimens have been submitted. To the decision of such competent observers I yield so far as to publish a figure, at the same time that I reserve my original opinion as one which I have not altogether laid aside.

C. botryocarpum is known from *C. rubrum* by its remarkable fruit, consisting of a great number of favellæ, without involucre, heaped together like bunches of grapes; in this respect it agrees with *C. Deslongchampsii*. I have, however, occasionally found solitary, involucrate favellæ, exactly similar to those of *C. rubrum*, on the same plants which produced clustered fruit on most of their branchlets. The colour is generally darker, and more purple than in *C. rubrum*, and the tips of the branchlets are straight. These are the principal characters on which it is proposed to establish the species.

C. botryocarpum was discovered by Miss Amelia E. Griffiths in 1844, in great plenty on Preston rocks, a short distance south of Torquay, and has been gathered every subsequent season in the same situations and in equal abundance. It is in perfection in June and July, and begins to decay about the middle of September.

Fig. 1. CERAMIIUM BOTRYOCARPUM;—*the natural size*. 2. Part of a branch, with fertile ramuli. 3. Ramulus with ordinary favellæ. 4. Ramulus with an involucrate favella. 5. Ramulus with tetraspores. 6. A tetraspore:—*all more or less magnified*.

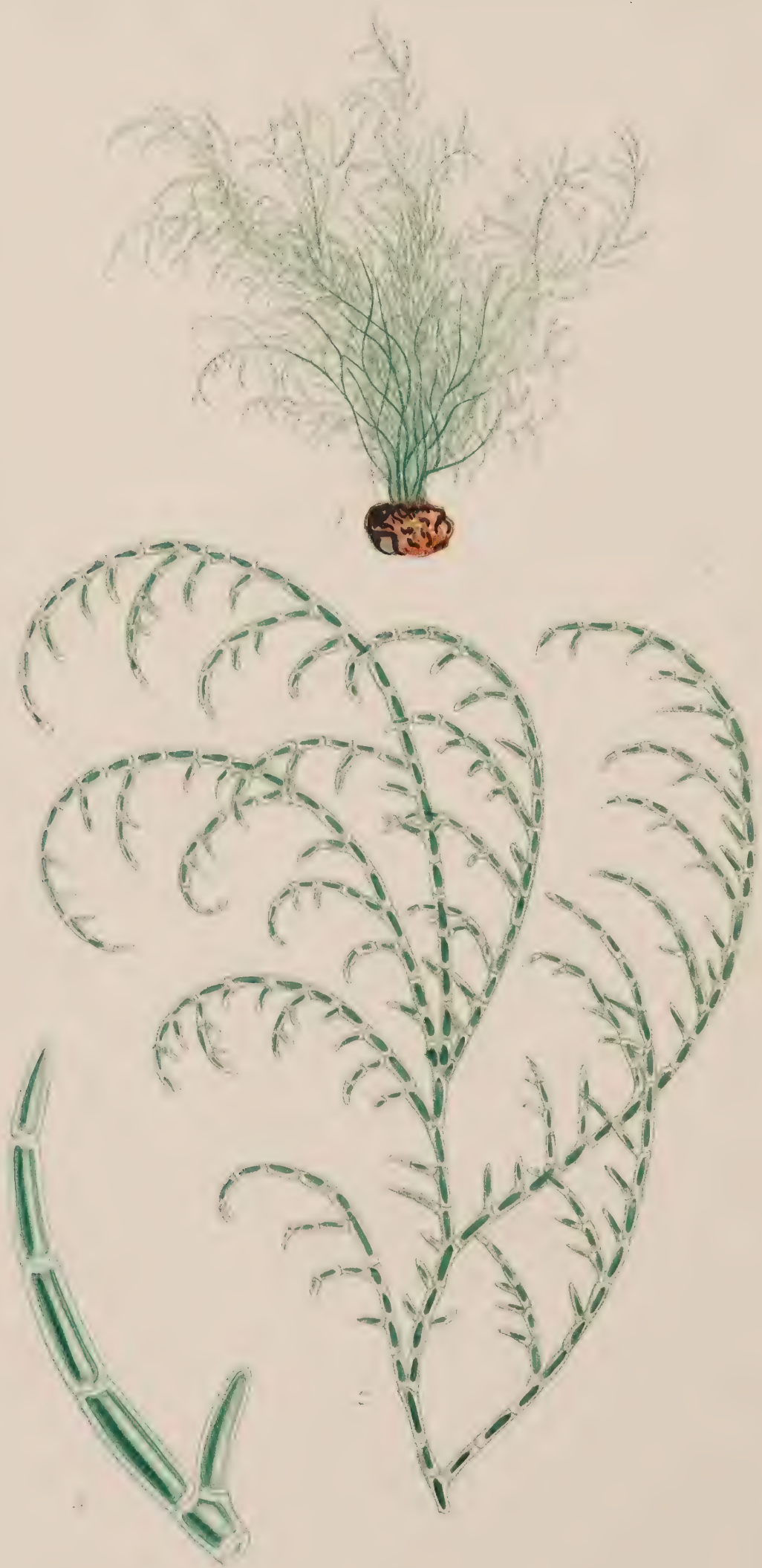


PLATE CCXVI.

CLADOPHORA FALCATA, *Harv.*

GEN. CHAR. *Filaments* green, jointed, uniform, branched, *Fruit*, aggregated granules or zoospores, contained in the joints, having, at some period, a proper ciliary motion. CLADOPHORA (*Kütz.*),—from *κλαδος*, a *branch*, and *φορεω*, to *bear*.

CLADOPHORA *falcata*; densely tufted, dark-green; filaments intricate at the base, ultra-capillary, rigid, much curved, irregularly branched; branches zig-zag, repeatedly divided, the lesser divisions arched, or strongly incurved and falcate, furnished along their inner faces with short, secund, blunt ramuli; articulations three or four times longer than broad, with a dense endochrome, and pellucid dissepiments.

CLADOPHORA *falcata*, *Harv. in Herb.*—*Phy. Brit.* vol. i. p. 14.

HAB. The bottoms of clear rock-pools, near low-water mark. Annual. Summer. Rocks outside Dingle Harbour, Kerry, *W. H. H.* (1845). Jersey, *Miss White*.

GEOGR. DISTR. British Islands.

DESCR. *Filaments* densely tufted, somewhat interwoven and entangled at the base, three or four inches high, thicker than human hair, nearly of equal diameter throughout, much branched and repeatedly divided. *Branches* curved and twisted, or curled in various directions, irregularly divided; the lesser branches sometimes alternate, sometimes secund, and sometimes two or three springing from the same point, all very erect, arching or strongly hooked inwards, furnished on their concave side with numerous secund ramuli of unequal length, long and short occurring alternately, the shorter ramuli simple, formed of one or two cells; the longer bearing a second series on their faces, and hooked like the branches. The aspect of the whole tuft is peculiarly crisp and squarrose. *Articulations* tolerably uniform, three or four times as long as broad, with hyaline borders and dissepiments, and containing a dense endochrome, which partially recovers its form after having been dried. *Colour*, a rich, glossy, full green. *Substance* rigid and crisp, adhering to paper in drying.

I gathered a few specimens of the *Cladophora* here figured in the summer of 1845, in some deep rock-pools, near low-water mark, under a steep mural cliff, in a situation where the fronds were constantly in shade. More recently I have received from Miss White specimens collected at Jersey, which agree in most

characters with the West of Ireland plant, but are not exactly true to the type. Beautiful, and apparently distinct, as our *C. falcata* is, I am by no means satisfied that it should be regarded as a true species. For, omitting the curled branches and the bending of the ramuli to one side, there are little or no characters to keep it separate from *C. latevirens*. I am not disposed to attach much value to the curvature of the branches, as an absolute character,—at least until the species has been longer observed; meantime, the beauty of this little plant, be it species or variety, has tempted me to bestow a figure on it.

Fig. 1. CLADOPHORA FALCATA :—*the natural size*. 2. Portion of a branch, with branchlets. 3. Articulations ;—*both more or less magnified*.



PLATE CCXVII.

RHODYMENIA? PALMATA, *Grev.*

GEN. CHAR. *Frond* flat, membranaceous, or subcoriaceous, ribless, veinless, cellular; central cells of small size; those of the surface minute. *Fructification* of two kinds, on distinct individuals; 1, convex *tubercles* (*coccidia*), having a thick, cellular pericarp, and containing a mass of minute spores, on a central placenta; 2, *tetraspores*, either zoned or tripartite, imbedded among the cells of the surface, scattered or forming cloudy patches. RHODYMENIA (*Grev.*),—from *ῥόδεος*, *red*, and *ἰμην*, a *membrane*.

RHODYMENIA *palmata*; frond coriaceous or submembranaceous, purple, broadly wedge-shaped, irregularly cleft, palmate, or dichotomous, sometimes repeatedly laciniate; the margin flat and even, sometimes winged with leaflets; granules distributed over the whole frond in cloud-like spots.

RHODYMENIA *palmata*, *Grev. Alg. Brit.* p. 93. *Hook. Br. Fl.* vol. ii. p. 291. *Wyatt, Alg. Danm.* no. 110. *Harv. in Mack. Fl. Hib.* part 3. p. 195. *Harv. Man.* p. 63.

SPHÆROCOCCLUS *palmatus*, *Kütz. Phyc. Gen.* p. 409. t. 63. f. 1.

HALYMENIA *palmata*, *Ag. Syn.* p. 55. *Ag. Sp. Alg.* vol. i. p. 204. *Ag. Syst.* p. 242. *Spreng. Syst. Veg.* vol. iv. p. 333. *Hook. Fl. Scot.* part 2. p. 107. *Post. and Rupp.* p. 18.

DELESSERIA *palmata*, *Lamour. Ess.* p. 37.

ULVA *palmata*, *Dec. Fl. Fr.* vol. ii. p. 12. *With.* vol. iv. p. 123. *Lyngb. Hyd. Dan.* p. 24. *Grev. Fl. Edin.* p. 298.

FUCUS *palmatus*, *Linn. Sp. Pl.* p. 1630. *Huds. Fl. Ang.* p. 579. *Lightf. Fl. Scot.* p. 933. t. 27. *Good. and Woodw. Linn. Trans.* vol. iii. p. 163. *Gunn. Fl. Norv.* vol. ii. p. 69. *Turn. Syn.* p. 175. *Turn. Hist.* t. 115. *E. Bot.* t. 1306. *Hook. in Fl. Lond.* New Series, with a figure.

FUCUS *ovinus*, *Gunn. Fl. Norv.* vol. i. p. 96. *Mohr. Hist. Isl.* p. 245.

FUCUS *caprinus*, *Fl. Dan.* t. 1128. *Esper. Ic.* p. 146. t. 74.

FUCUS *bullatus*, *Fl. Dan.* t. 770.

FUCUS *rubens*, *Esper. Ic.* t. 75.

FUCUS *dulcis*, *Gmel. Hist.* p. 189. t. 26. (*fide Turner.*)

Var. *β. marginifera*; frond oblong, subsimple, proliferous at the margin. (*Tab. Nost. CCXVII.*)

FUCUS *palmatus*, *Stack. Ner. Brit.* p. 54. t. 12.

ULVA *caprina*, *Gunn. Fl. Norv.* vol. ii. p. 126. t. 6. f. 4.

Var. *γ. simplex*; frond undivided, wedge-shaped.

HALYMENIA *palmata* *δ, simplex*, *Ag. Syn.* p. 36.

Var. *δ. Sarniensis*; frond laciniated, the segments narrow and sublinear.

FUCUS *Sarniensis*, *Mert. in Roth. Cat. Bot.* vol. iii. p. 103. t. 1. *Turn. Hist. Fuc.* t. 44.

FUCUS delicatulus, *Fl. Dan.* t. 1190.

SPHÆROCOCCUS sarniensis, *Hook. Fl. Scot.* part 2. p. 103. *Kütz. Phyc. Gen.* p. 409.

Var. ϵ . *soboliferus*; frond stipitate, membranaceous, the branches very narrow below, much divided, expanding upwards into wedge-shaped, jagged and laciniate lobes.—(*Tab. Nost. CCXVIII. fig. 2.*)

RHODYMENIA sobolifera, *Grev. Alg. Brit.* p. 95. *Hook. Br. Fl.* vol. ii. p. 292. *Harv. in Mack. Fl. Hib.* part 3. p. 195. *Harv. Man.* p. 63.

SPHÆROCOCCUS soboliferus, *Kütz. Phyc. Gen.* p. 409.

HALYMENIA sobolifera, *Ag. Syn.* p. 36. *Ag. Sp. Alg.* vol. i. p. 218. *Ag. Syst.* p. 246. *Hook. Fl. Scot.* part 2. p. 107.

ULVA sobolifera, *Lyngb. Hyd. Dan.* p. 27.

FUCUS soboliferus, *Fl. Dan.* p. 1065. *Turn. Hist.* t. 45. *Wahl. Fl. Lapp.* p. 947. *E. Bot.* t. 2133.

HAB. On rocks within tide marks; and on the stems of *Fuci*, *Laminariæ*, &c. Annual or biennial. Winter and spring. Common on all the British shores. β . and γ . on the stems of *Laminariæ*. ϵ . on *Fucus serratus*.

GEOGR. DIST. Shores of Northern and Arctic Europe. Iceland. Greenland. Eastern shores of North America. Unalashka. Kurile Islands. Kamshatka. Falkland Islands. Tasmania.

DESCR. *Root*, a small disc. *Fronds* solitary or tufted, rising from a more or less evident subcylindrical stipe, from a line to half an inch long, or more, which soon flattens into the wedge-shaped base of the lamina; *lamina* broadly wedge-shaped or fan-shaped, somewhat fastigiate, more or less deeply cloven into numerous segments, which are often again and again divided in a palmate or subdichotomous manner. So variable is the degree of division in different specimens that it is impossible to write a general character which shall embrace all the forms. In some, the frond is quite simple, broadly oval or wedge-form; in others it is cleft into four or five principal segments, the margin emitting leaf-like lobes:—these varieties are usually of large size, 12–18 inches long, of a coriaceous substance and dark colour. Other states (vars. δ . and ϵ .) are thinner in substance, and excessively divided, the lower segments filiform, the upper split into innumerable narrow ribbons, often not half a line in breadth; these sometimes expand again into wedge-shaped lobes, lacinated at the extremity; and sometimes the whole frond is excessively branched, and none of its divisions more than half a line in breadth; the narrow and lacinate varieties are seldom more than five or six inches in length. *Fructification*; *tetraspores*, half immersed in the frond, forming large cloudy patches dispersed over the whole frond. Besides these, an imperfect *tubercular* fructification (?) is sometimes found, forming circular spots surrounded by a discolouration. Within the circle are congregated innumerable minute, dark-coloured pustules, immersed in the frond, slightly prominent and either empty, or containing a mass of granular endochrome. *Substance* in the larger varieties leathery, in the smaller membranaceous; the latter adhering closely to paper. *Colour*, a purplish or brownish red; sometimes pinky.

Fig. 1. RHODYMENIA PALMATA, var. β .:—of the natural size. 2. Portion of the surface with tubercles (?). 3. Section of the frond and tubercles (?). 4. Portion of the surface, with part of a Sorus. 5. Tetraspores:—all more or less magnified.



PLATE CCXVIII.

RHODYMENIA PALMATA; *vars. a and ε.*

(For description, see last folio.)

This and the preceding plate represent three forms of *Rhodymenia palmata*, the well known *Dulse* of the Scotch, and *Dillisk* of the Irish;—and had I figured all the characteristic specimens which my Herbarium supplies, I might easily have extended the illustrations to a dozen plates. To connect Fig. 1. of Pl. CCXVII, with Fig. 3. of Pl. CCXVIII, by a full suite of specimens would require many figures. At first sight it will scarcely be supposed that they can belong to the same plant, and yet these figures by no means exhibit the extreme of variation, for there are varieties more simple than the one and more finely divided than the other. There is one state (var γ .) in which the frond is absolutely a simple elliptical leaf, without any division, or with a faint tendency to lobation at their apex. And there is another (var ϵ .) which is occasionally cut into multitudes of many-cleft ribbon-like segments, in no place more than half a line in width. And yet these two forms can be clearly brought together by specimens of intermediate character.

When such varieties are seen in a dried state in the herbarium, they appear so different that one may anticipate much difficulty in tracing the limits of the species. And it might indeed be difficult to do so with the assistance merely of dried specimens and of the descriptions of authors. But on the shore the collector experiences no such difficulty. If he has once seen and *tasted* a piece of *Dulse*, the characters, irrespective of form, are too well marked to allow of his puzzling himself with mere variations in outline. And what is very remarkable, the broad and slightly divided varieties may often be found growing side by side with the finely cut narrow ones. I have frequently noticed that where the *Dulse* grows on rock, it is broad and slightly divided; but when it grows on *Fucus serratus*, on the same rock, it is cut into the form called *sobolifera*. This would seem to prove that habitat had some effect, or, in other words, that the root of this

seaweed was something more than a mere holdfast. Yet epiphytic (or parasitic) attachment has not always the same effect on this plant; for the simplest form of this species is undoubtedly found on the stems of *Laminaria digitata*, and authors give the same stems as a habitat for the finely cut variety, *sobolifera*. My own experience would confine this variety to the stems of *Fucus serratus* and *vesiculosus*.

The extensive list of synonyms given in the description shows a large number of book species formed out of the varieties of this plant. Most of these are admitted by modern authors to be, what I have considered them, merely forms of *R. palmata*. But my var ϵ . has hitherto, in British works, maintained its place under the name *R. sobolifera*. I can only say that I can in no respect distinguish specimens which I have received from Orkney, the original British habitat of *R. sobolifera*, from others collected on the Irish coast which I have clearly traced, through connecting forms, into the common *palmata*. I am therefore at a loss to know on what character to uphold *sobolifera*. Colour and substance are here too variable to allow of their being taken into account; some of the most pinky and delicately membranous specimens which I possess, have the outline of the true *palmata*, not of *sobolifera*.

In Ireland and Scotland this plant is much used by the poor, as a relish with their food. It is commonly dried, in its unwashed state, and eaten raw, the flavour being brought out by long chewing. On many parts of the west coast of Ireland, it forms the only addition to potatoes, in the meals of the poorest class. The variety which grows on mussel shells between tide marks is preferred, being less tough than other forms, and the minute mussel shells and other small shell-fish which adhere to its folds are nowise unpleasing to the consumers of this simple luxury, who rather seem to enjoy the additional *gout* imparted by the crunched mussels. In the Mediterranean this plant is used in a cooked form, entering into ragouts and made dishes; and it forms a chief ingredient in one of the soups recommended, under the name of "St. Patrick's Soup," by M. Soyer to the starving Irish peasantry.

Fig. 1. RHODYMENIA PALMATA, var α . 2. The same, var. ϵ :—both the natural size.



PLATE CCXIX.

CERAMIUM DESLONGCHAMPII, *Chauv.*

GEN. CHAR. *Frond* filiform, one-tubed, articulated; the dissepiments coated with a stratum of coloured cellules, which sometimes extend over the surface of the articulation. *Fructification* of two kinds, on distinct individuals; 1, *tetraspores*, either immersed in the ramuli, or more or less external; 2, sessile, roundish *receptacles* (*favellæ*), having a pellucid limbus, containing minute, angular spores, and subtended by one or more short, involucral ramuli. CERAMIUM (*Roth.*), —from *κεραμος*, a *pitcher*, but the fruit is not pitcher-shaped.

CERAMIUM *Deslongchampii*; filaments subsetaceous, attenuated upwards, rigid, irregularly dichotomous, with or without lateral ramuli; the apices straight, spreading; articulations colourless, those of the main stems about thrice as long as broad, of the branches and ramuli much shorter; dissepiments opaque, scarcely swollen; tetraspores whorled round the joints, prominent; favellæ (?) heaped together, bursting irregularly from the sides of the branches, destitute of involucral ramuli.

CERAMIUM *Deslongchampii*, *Chauvin*, *Alg. Norm. J. Ag. Advers.* p. 26.
Wyatt, *Alg. Danm.* no. 218. *Hook. et Harv. in Lond. Journ.* vol. vi. p. 410.

CERAMIUM *Agardhianum*, *Griff. in Harv. Man.* p. 99.

GONGROCERAS *Deslongchampii*, *Kütz. in Linn.* 15. p. 735. *Phyc. Gen.* p. 379.
t. 46. f. 1.

HAB. On rocks and stones between tide-marks, and on the smaller Algæ. Annual. Spring and summer. Generally distributed round the British coasts. Torquay, *Mrs. Griffiths*. Swansea, *Mr. Ralfs*. Mine Head, Somerset, *Miss Gifford*. Ardrossan, *Rev. D. Landsborough*. Frith of Forth, *Dr. Greville*. Belfast Bay, *Mr. Templeton*. Dublin Bay, *Miss Ball*. Very abundant at Balbriggan, &c., *W.H.H.*

GEOGR. DISTR. Coast of France. Heligoland, *Binder*! Tasmania, *Gunn*.

DESCR. *Root* discoid, occasionally giving off short fibres. *Fronds* densely tufted, from two to four or five inches long, rather thicker than human hair, rigid and with a rough feel, slightly attenuated upwards, branched in a more or less regularly dichotomous order, the angles not very patent. *Branches* much divided, either naked throughout, or giving off, in greater or less abundance, short, simple, or forked, lateral ramuli. These ramuli are distributed in a very irregular manner; sometimes alternate, more frequently secund, and often very densely crowded, especially in the upper portion of the frond, which then becomes very bushy. Sometimes, as represented in fig. 2, the frond is very much distorted; the branches spreading at right angles, and the ramuli variously curved and twisted. *Apices* of the branches straight and spreading, subulate. *Articulations* pellucid, those of the lower part of the stem about thrice as long as broad, of the branches about equalling

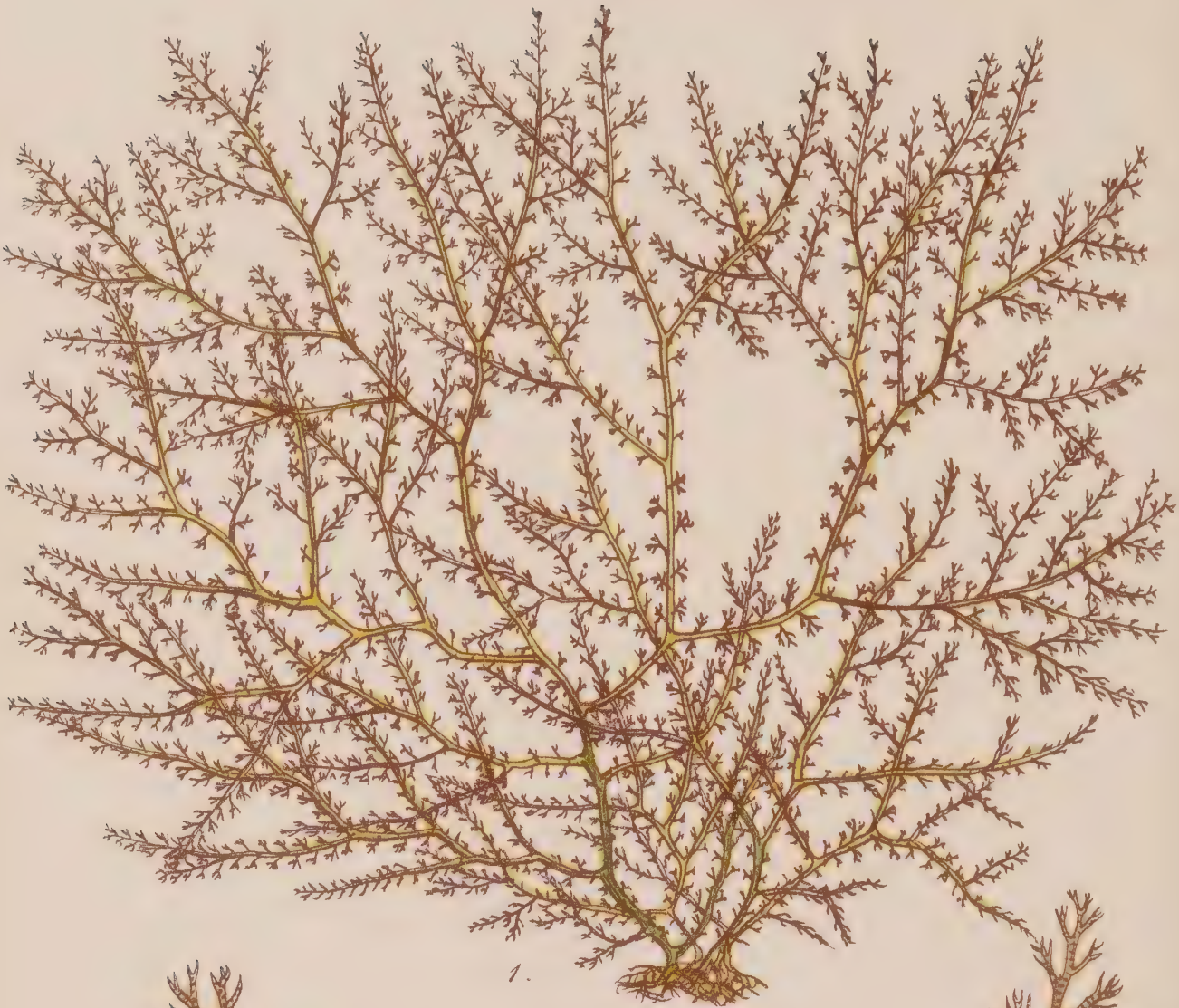
their breadth, and of the ramuli gradually shorter; *dissepiments* dark-coloured, cylindrical, or slightly swollen. *Tetraspores* several in each joint, whorled, large, and very prominent. *Favellæ* (?) imperfectly organized, very irregular in form, issuing in dense clusters from the sides of the branches, heaped together, destitute of involucre, containing a fine dark-coloured powder, but no regularly formed *spores*. These *favellæ* (?) are produced by the same individuals that contain tetraspores. *Substance* rigid, not closely adhering to paper, unless after long steeping in fresh water. *Colour*, a dark brownish purple or blackish red.

A more slender plant than *C. diaphanum*, of a darker colour, and with shorter joints, and further distinguished from that species by the straight tips of the branches, more prominent tetraspores, and above all, by the clustered *favellæ*, bursting in irregular masses from various parts of the stem and branches. I confess that I cannot regard these clusters as a normal fructification, nor am I confident that they are even imperfectly formed *favellæ*, but rather consider them as erumpent masses of cells, of an anomalous character. From true *favellæ* they differ in being destitute of involucral ramuli, and also in their structure, the contents being a fine powder compacted together, without trace of *spores*, such as are usually found in these organs.

A distorted variety (fig. 2) frequently occurs among normal specimens, and this is very generally furnished with the anomalous fruit. Some specimens are excessively squarrose, with the stem and branches regularly bent at short distances, and every ramulus divaricating.

Our figure has been printed in too red an ink.

Fig. 1. Tuft of CERAMIIUM DESLONGCHAMPII. 2. A distorted frond:—*both of the natural size*. 3. Portion of the main stem. 4. Apex of a branch, with imbedded tetraspores. 5. Fertile joints from the same, with tetraspores *in situ*. 6. Apex of a branch, with erumpent *favellæ* (?). 7. Joints from the same, with *favellæ* (?) and *tetraspores*:—*all more or less magnified*.



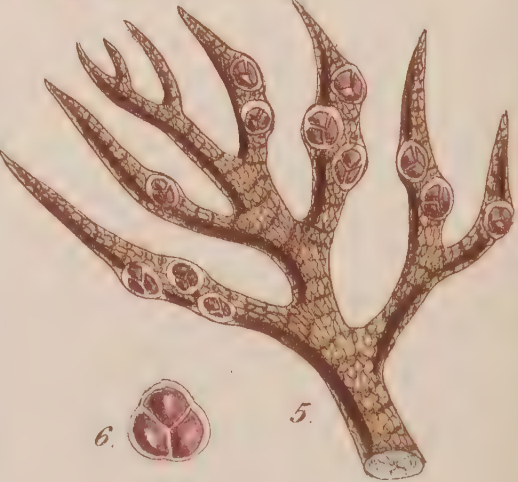
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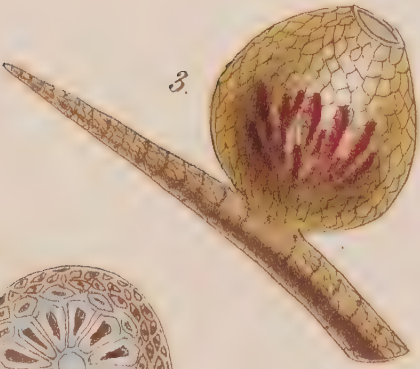
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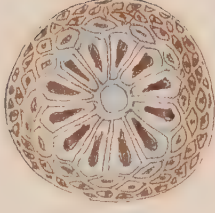
3.



7.



6.



8.

PLATE CCXX.

RYTIPHLÆA FRUTICULOSA, *Harv.*

GEN. CHAR. *Frond* filiform or compressed, pinnate, transversely striate, reticulated; the axis articulated, composed of a circle of large, tubular, elongated cells (*siphons*), surrounding a central cell; the periphery of several rows of minute, irregular, coloured cellules. *Fructification* of two kinds, on distinct individuals; 1, ovate *capsules* (*ceramidia*), containing a tuft of pear-shaped spores; 2, *tetraspores*, contained in minute lanceolate *receptacles* (*stichidia*), in a double row. RYTIPHLÆA (*Ag.*),—from *ρυτίς*, a *wrinkle*, and *φλοιός*, the *bark*; because the surface is transversely wrinkled or striate.

RYTIPHLÆA *fruticulosa*; stems diffuse, branched from the base; branches divaricating pinnato-dichotomous, set in the lower part with short, horizontal, multifid ramuli; in the upper more or less pinnated with larger, similarly divided branchlets; axils rounded; *ceramidia* ovate, sessile, densely set; *tetraspores* in distorted ramuli.

POLYSIPHONIA *fruticulosa*, *Spreng. Syst. Veg.* vol. iv. p. 350. *Duby, Bot. Gall.* p. 966. *Harv. in Mack. Fl. Hib.* part 3. p. 205. *Harv. in Hook. Br. Fl.* vol. ii. p. 327 (*in part*). *Harv. Man.* p. 86. *Wyatt, Alg. Danm.* no. 132. *Mont. Crypt. Alg.* n. 19. *Fl. Alg.* p. 81. *Mont. Crypt. Canar.* p. 170. *Endl. 3rd Suppl.* p. 46.

POLYSIPHONIA *Wulfeni*, *Ag. Alg. Medit.* p. 144. *Kütz. Phyc. Gen.* p. 431.

HUTCHINSIA *fruticulosa*, *Ag. Syst.* p. 27.

HUTCHINSIA *Wulfeni*, *Ag. Sp. Alg.* vol. ii. p. 95.

GRAMMITA *Wulfeni*, *Bonn. Hyd.* p. 27.

CERAMIUM *Wulfeni*, *Roth, Cat. Bot.* vol. iii. p. 140.

FUCUS *fruticulosus*, *Wulf. in Jacq. Col.* p. 159. t. 16. *Crypt. Ag.* p. 56. *Esper, Ic. Fuc.* p. 165. t. 87. *Clem. Ess.* p. 319. *E. Bot.* t. 1686. *Turn. Syn. Fuc.* vol. ii. p. 394. *Turn. Hist.* t. 227.

HAB. In pools left by the tide, growing on the rocky bottom, or on Coral-lines and other small Algæ. Perennial. Summer. Common on the western and southern shores of the British Islands.

GEOGR. DISTR. Atlantic and Mediterranean shores of Europe. Northern coasts of Africa. Canary Islands.

DESCR. *Root* a mass of creeping, entangled fibres. *Fronds* forming large, globose tufts, often six inches in diameter, composed of a great number of separate stems intertwined together. *Stems* 4–6 inches long, twice as thick as hog's bristle, gradually attenuated upwards, branched from the base and bushy. Main *branches* somewhat dichotomous, spreading at wide angles; the upper and small divisions repeatedly pinnate, or irregularly branched. The lower branches are furnished with alternate, multifid ramuli, a line or two in length and very patent; the upper more regularly pinnate with longer branchlets, which are set with simple or multifid subulate ramuli. Every part of the frond is marked by dark-coloured transverse striæ, set at

short distances asunder (revealing the joints of the internal axis), and the whole surface is reticulated with anastomosing cells. *Fructification*: 1, *Ceramidia*, densely crowded on the ramuli, ovate, sessile; rarely produced: 2, tetraspores imbedded in the multifid, lateral ramuli. *Substance* cartilaginous and firm, the tips of the branches standing out, and each retaining a drop of water when the specimen is lifted into air. *Colour* a dark purple, changing into olive green, and finally to amber-yellow under the influence of sunlight.

I have always thought that in whatever genus we put *Rytiphlæa complanata* of Agardh, in the same we must place not only the *Polysiphonia thuyoides* of British authors, but *P. fruticulosa* also. The internal structure of these plants is identical. They all possess a central jointed axis composed of many tubes, like the frond of *Polysiphonia*, coated on the outside by a broad band of small irregular cells. The surface appears reticulated under the microscope, and marked at short intervals by dark-coloured transverse lines. These characters belong to the frond of *Rytiphlæa*, in which genus Agardh places the first of the three plants in question; while both the latter have hitherto been referred to *Polysiphonia*. As I have already (Pl. CLXX.) adopted Agardh's name for the former, I am now constrained to alter the position of the two latter, and transfer them from *Polysiphonia* to *Rytiphlæa*. These three plants have not only a similar structure, but have so much the same natural habit, that specimens may be found which bring them *inconveniently* near each other. Some specimens of *R. fruticulosa* are very close to some of *R. thuyoides*, and the latter, in like manner, closely approaches narrow states of *R. complanata*. So nearly do they approach, that at one time I regarded them all as merely sportive forms of one species, but this was before I had much opportunity of studying them in a living state. When growing, each possesses characters sufficiently obvious. It is only in a few cases of imperfect or badly dried specimens that the student will find it difficult to decide to which species the specimen should be referred.

The ceramidia of this species are not often found, but when they occur they are generally formed in profusion, almost every twig bearing one or two. They are always borne on less luxuriant specimens than those which yield tetraspores.

Fig. 1. RYTIPHLÆA FRUTICULOSA:—of the natural size. 2. Small branch with ceramidia. 3. A ceramidium *in situ*. 4. Small branch from another plant. 5. Ramulus with imbedded tetraspores. 6. Tetraspore. 7. Portion of the stem. Section of the same:—all more or less magnified.

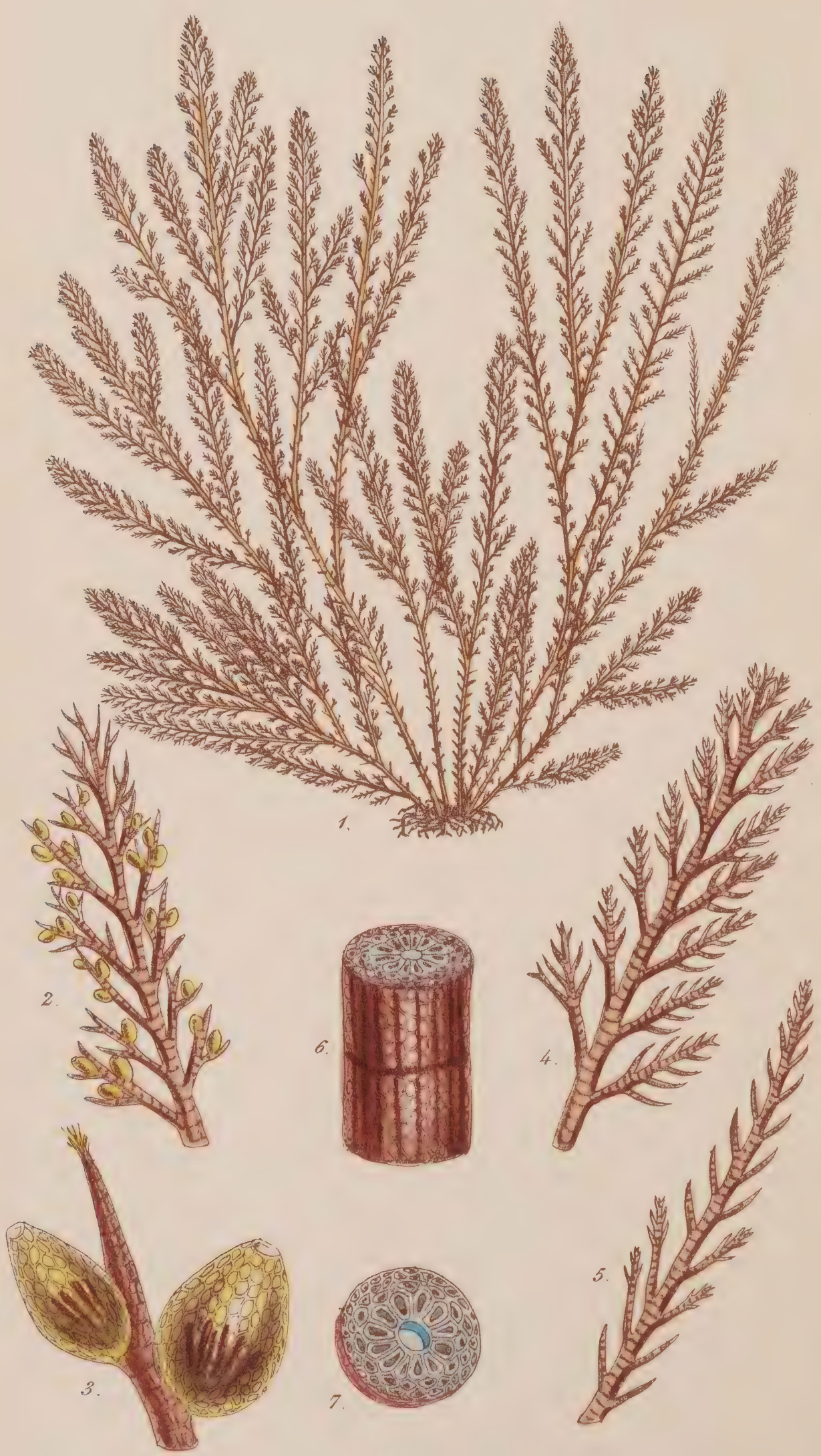


PLATE CCXXI.

RYTIPHLÆA THUYOIDES, *Harv.*

GEN. CHAR. *Fronde* filiform or compressed, pinnate, transversely striate, reticulated; the axis articulated, composed of a circle of large, tubular, elongated cells (*siphons*), surrounding a central cell; the periphery of several rows of minute, irregular, coloured cellules. *Fructification* of two kinds, on distinct individuals; 1, ovate *capsules* (*ceramidia*), containing a tuft of pear-shaped spores; 2, *tetraspores*, contained in minute, lanceolate *receptacles* (*stichidia*) in a double row. RYTIPHLÆA (*Ag.*),—from *ρυτίς*, a *wrinkle*, and *φλοιός*, the *bark*, because the surface is transversely wrinkled or striate.

RYTIPHLÆA *thuyoides*; stems erect, rising from creeping fibres, terete; below simple and set with short, spine-like ramuli; above much branched; branches alternate, very erect, bi-pinnate; pinnæ multifid or pinnulate; axils rounded; *ceramidia* ovate, sessile, densely set.

POLYSIPHONIA *thuyoides*, *Harv. in Mack. Fl. Hib. part 3. p. 205. Wyatt, Alg. Danm. no. 305. Harv. Man. p. 86. E. Bot. Suppl. t. 2882.*

GRAMMITA *rigidula*, *Bonnem.*

HAB. In pools left by the tide, growing either on the rocky bottom or on Corallines and other small Algæ. Perennial. Summer. Abundant on the west coast of Ireland. Portrush, *Mr. Moore*. Howth and Balbriggan, *Miss Gower*. Ayrshire coast, *Mr. Thompson and Rev. D. Landsborough*. South coast of England, Devonshire, *Mrs. Griffiths*. Mountsbay and Ilfracombe, *Mr. Ralfs*. Jersey, *Miss White*.

GEOGR. DISTR. Atlantic shores of Europe.

DESCR. *Root*, a widely spreading mass of creeping fibres. *Fronde*s from three to six inches high, twice as thick as hog's bristle, forming wide, but not very crowded tufts. *Stems* very variable in division: in some specimens nearly simple, with three or four long, rod-like branches, set with very short pinnulate ramuli; in others naked at the base, but closely and regularly pinnated or bipinnated from the middle upwards, the pinnæ long and virgate, closely pinnulate. Other specimens are excessively bushy, the branches springing from the upper part of the stem in a very irregular manner. In all varieties the branches are remarkably erect, and generally straight, and more or less regularly pinnate or bipinnate. *Ramuli* below simple and subulate, above pinnulate and forked, one or two lines long. The whole frond is marked with transverse striæ at distances about equal to the diameter, and the surface is reticulated with anastomosing cells. *Fructification*; *ceramidia* oblong-ovate, densely crowded on the ramuli, sessile, containing a tuft of pear-shaped spores. *Tetraspores* in distorted ramuli. *Substance* somewhat rigid, between cartilaginous and membranaceous. *Colour*, a fine dark brownish purple, becoming more or less tinted with olive when exposed to sunlight.

From *Rytiphlæa complanata* this species may always be known by its darker colour, cylindrical stems, and generally by a narrower frond. In ramification and general habit there is much similarity. The two may sometimes be found growing in close proximity, and even mixed together, but I have generally observed that *R. thuyoides*, which is the stiffest in substance, usually grows in the shallow parts of the tide-pool, sometimes standing out of the water; while *R. complanata* never dries during the recess of the tide. On the west coast of Ireland this is a very abundant plant, growing on most rocky shores. It forms dense tufts of large size, but is often much stunted, and is only to be found well grown in the deeper pools near low-water mark.

From *R. fruticulosa* the erect habit and more regularly pinnate ramification distinguish it. In some specimens these characters are less strikingly manifest than in others, but it rarely happens that the branching is so patent or irregular as to cause the specimens to be mistaken for one of the former species.

Small specimens of *Polysiphonia nigrescens* much resemble the present species in habit, but are at once known under the microscope, by the very different structure of the frond.

Fig. 1. RYTIPHLÆA THUYOIDES :—*of the natural size.* 2. Branch with *Ceramidia*. 3. *Ceramidia*. 4, 5. Branchlets from different specimens. 6. Portion of the stem. 7. Transverse section of the same :—*all more or less magnified.*

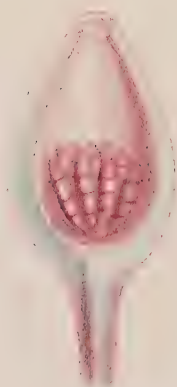


PLATE CCXXII.

CORALLINA OFFICINALIS, *Linn.*

GEN. CHAR. *Fron*d filiform, articulated, branched (mostly pinnate), coated with a calcareous deposit. *Fructification*; turbinate or obovate, mostly terminal *ceramidia*, pierced at the apex by a minute pore, and containing a tuft of erect, pyriform, or club-shaped, transversely parted tetraspores. CORALLINA (*Linn.*),—from *Corallium*, coral, which these plants resemble in being of a stony nature.

CORALLINA *officinalis*; decompound-pinnate; lower articulations cylindrical, twice as long as broad; upper slightly obconical, round-edged, their upper angles blunt; ultimate ramuli cylindrical, obtuse.

CORALLINA *officinalis*, *Syst. Ed.* x. p. 805. *Pal. Elench.* p. 422. *Ellis in Phil. Trans.* vol. 57. p. 419. t. 17. f. 12, 13. *Linn. Corresp.* vol. i. p. 201. *Soland. Zoop.* p. 118. t. 23. f. 14, 15. *Esper. Corall.* t. 3. *Berk. Syn.* vol. i. p. 211. *Jameson in Wern. Mem.* vol. i. p. 563. *Turt. Gmel.* vol. iv. p. 671. *Turt. Br. Faun.* p. 211. *Stem. Elem.* vol. ii. p. 439. *Cuv. Reg. An.* vol. iii. p. 305. *Lamour. Cor. Flex.* p. 283. *Lamour. Corall.* p. 127. *Lamk. An. S. vert.* vol. ii. p. 328. 2nd edit. vol. ii. p. 513. *Flem. Brit. An.* p. 514. *Gray, Brit. Pl.* vol. i. p. 339. *Blainv. Actinol.* p. 547. t. 96. f. 3, 3 a. *Johnst. Br. Sponges and Lith.* p. 216. *Decaisne, Ess.* p. 107. *Kütz. Phyc. Gen.* p. 388. t. 79. f. 1. *Endl. 3rd Suppl.* p. 48. *Mont. Fl. Alger.* p. 128.

CORALLINA *anglica*, *Ger. Herb.* 1572. *Merrett, Pin.* 30. *Raii, Hist.* vol. i. p. 65. *Syn.* 33. no. 1.

HAB. On rocks between tide-marks, extending throughout the whole of the litoral zone, generally growing in rock-pools. Perennial. Winter and spring. Abundant on all the rocky shores of the British Islands.

GEOGR. DISTR. Throughout the northern Atlantic Ocean and in the Mediterranean Sea. (Extra-European habitats require investigation.)

DESCR. *Root*, a widely spreading, calcareous crust. *Fron*ds from one to six inches high, twice as thick as hog's bristle, congregated in dense tufts, or spreading in continuous patches over a wide surface of rock, varying much in ramification and general aspect, according to the depth at which vegetation takes place. Well-grown specimens are 4–6 inches high, more or less regularly pinnate, or bi-tripinnate; the pinnæ sometimes rising, in opposite pairs, from every joint; in others several joints intervene between each pair of pinnæ, or one pinna is wholly suppressed. Various irregularities in branching take place from suppression, and some specimens are thus reduced to long naked, alternate or spuriously dichotomous branches; while others are regularly feathered throughout. *Ramuli* slender, cylindrical, obtuse, composed of joints three or four times as long as broad. *Articulations* in the lower part of the stem cylindrical, about twice as long as broad, or somewhat shorter: those of the upper branches more or less pear-shaped or obconical, gradually swelling from the base upwards, slightly compressed, but rounded at the edges, and having the upper angles very obtuse, and not prominent. When the calcareous matter is removed by acid, the surface

appears transversely striate. *Conceptacles* of two kinds : 1, ovate *ceramidia*, pierced with a minute pore, and containing a tuft of transversely parted oblong, tetraspores ; these terminate the branches and ramuli, and are of a pearly white colour. 2, slightly urceolate or mamillæform *ceramidia* of smaller size, springing irregularly from various parts of the articulations, and sometimes so densely crowded as to cover the whole articulation. These probably also contain tetraspores, but those which I examined were empty. The structure is similar to that of *C. squamata*. *Colour*, when growing in deep water or in shade, a dull, and rather dark purple ; under sunlight passing through various shades of dull red and yellow to a milk white, which is the common colour of specimens cast on the beach.

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This species is abundant on the shores of all countries within the temperate zone of the northern Atlantic, and perhaps it would not be too much to include distant regions of the Southern Ocean and the Pacific, among its habitats. Authors, however, have given distinct names to specimens coming from the south ; and too much uncertainty prevails among the exotic species of the genus *Corallina* to allow of our attempting, in the present place, a reconciliation of synonymes. Even on our own shores this plant puts on so many sportive appearances, that it would be easy to form from its varieties numerous species, as distinct as some that have been founded on single fragments coming from abroad. *Colour* has been assumed as a character in describing these plants. Nevertheless it is notorious that the colours of all Corallines are remarkably fugacious, and that all quickly bleach, under the influence of the weather, to a milky whiteness. The *form* of the joints, almost the only tangible character, is subject to very wild variations, so that it is almost impossible, without a very full suite of specimens, to fix the limits of any of these plants. Our figure represents what may be regarded as the normal form of *C. officinalis*, but this is very unlike the stunted variety which occurs near high-water mark. In the latter, the joints are sometimes palmate, and much spread out ; and altogether the plant looks so unlike its normal state that it may well be taken, as it has been, for something different.

According to Dr. Johnson, several of the *Melobesiæ* are to be regarded as merely imperfectly developed states of this Coralline.

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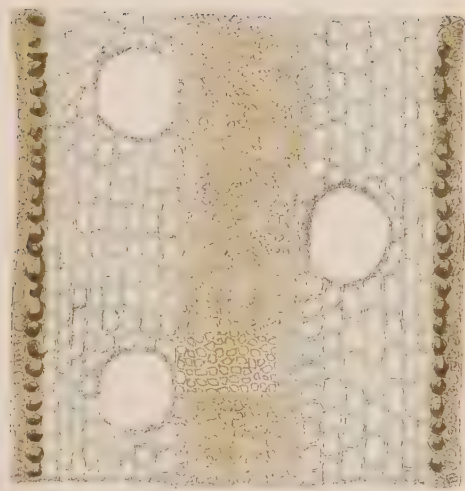
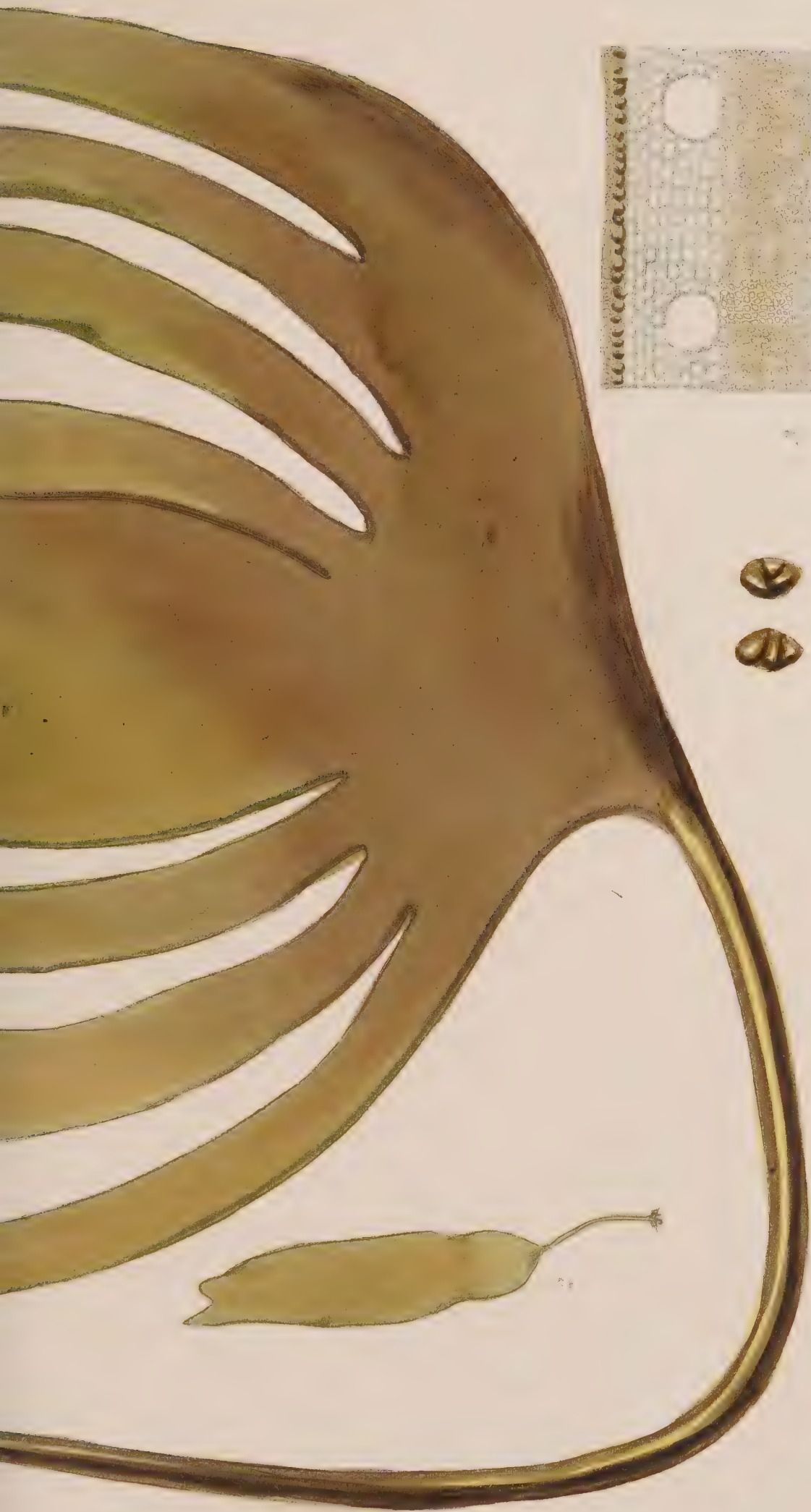
Fig. 1. CORALLINA OFFICINALIS :—of the natural size. 2. Branch with *normal* *ceramidia*. 3. A *Ceramidium*. 4. The same, cut vertically. 5. A tetraspore from the same. 6. Branch with *abnormal* *ceramidia*. 7. Joint from the same, with three *ceramidia*. 8. Portion of the frond, after maceration in acids :—all more or less magnified.

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## PLATE CCXXIII.

LAMINARIA DIGITATA, *Lamour.*

GEN. CHAR. *Frond* stipitate, coriaceous or membranaceous, flat, undivided or irregularly cleft, ribless. *Fructification*; cloudy spots of spores, imbedded in the thickened surface of some part of the frond. LAMINARIA (*Lamour.*),—from *lamina*, a thin plate, in allusion to the flat frond.

LAMINARIA *digitata*; stem long, woody, cylindrical, gradually tapering and somewhat compressed upwards, expanding into a leathery, roundish-oblong frond, deeply cleft into many linear segments.

LAMINARIA *digitata*, *Lamour. Ess.* p. 22. *Lyngb. Hyd. Dan.* p. 20. *Ag. Sp. Alg.* vol. i. p. 112. *Ag. Syst.* p. 270. *Grev. Alg. Brit.* p. 27. *Hook. Br. Fl.* vol. ii. p. 271. *Harv. in Mack. Fl. Hib.* part 3. p. 171. *Harv. Man.* p. 23. *Wyatt, Alg. Danm.* No. 156. *Endl. 3rd. Suppl.* p. 27. *Post. and Rupr.* t. 12. *J. Ag. Sp. Alg.* vol. i. p. 134.

LAMINARIA *stenoloba*, *De Lap. Terr. Neuv.* p. 55.

HAFGYGIA *digitata*, *Kütz. Phyc. Gen.* p. 346. t. 30. and 31.

FUCUS *digitatus*, *Linn. Mant.* p. 134. *Fl. Dan.* t. 392. *Stack, Ner. Brit.* p. 5. t. 3. *Esper*, p. 99. t. 48, 49. *Huds. Fl. Angl.* p. 579. *Lightf. Fl. Scot.* p. 935. *With.* 4. p. 98. *Linn. Trans.* 3. p. 152. *Turn. Syn.* p. 207. *Turn. Hist.* t. 162. *E. Bot.* t. 2274.

FUCUS *hyperboreus*, *Gunn. Fl. Norv.* 1. p. 34. t. 3.

HAB. On rocks in the sea, beyond the reach of the tide, extending to the depth of about fifteen fathoms. Perennial. Winter. Abundant on the shores of the British Islands.

GEOGR. DISTR. The Icy sea, and Northern Atlantic, from Norway to Spain, and from Greenland to the shores of Massachusetts (*at least*). Kamtschatka.

DESCR. *Root*, a conical mass composed of numerous, stout, branching fibres, each of whose branches ends in a flattened disc which takes a strong hold of the rocky bottom. *Stem* from two to six feet long, cylindrical, solid, in large specimens upwards of an inch in diameter near the base, gradually tapering upwards and becoming compressed towards the summit, where it passes into the base of the frond. *Frond* from one to five feet long, and from one to three feet in breadth, deeply cleft from the apex nearly to the base into an uncertain number of linear, strap-shaped, acute or obtuse segments. *Fructification* dark coloured, cloud-like patches, seen on old fronds, consisting of a stratum of innumerable, minute, angular, dark-coloured spores, concealed beneath the surface cells. *Substance* in the stem woody, but flexible, hard and horny when dry; in the frond, leathery. *Structure* cellular; the cells of the central portion of stem and frond very minute; those of the periphery larger; in the frond quadrate, with spherical air-cells at intervals. *Colour*, a fine clear olive, becoming darker in age.



A well known plant, the common *Sea-girdles* or *Tangle*, which grows to a large size on all rocky coasts. Our figure may appear a caricature to persons acquainted only with the plant in the state in which it is usually cast ashore, but I have purposely selected a specimen to illustrate its very curious mode of growth. The root and stem are perennial, but the many-cleft leaf is renewed every season and the old one cast off. Our specimen represents the nearly perfectly formed leaf of the present season and the base of the leaf of last year adhering to the tips of its segments. The mode of growth is as follows: As soon as the existing frond has served its purpose and begins to grow brown, an expansion commences between its base and the apex of the stem. This expansion continues to increase in length and breadth till it has attained a considerable size. We have then a large ovate lobe at the apex of the stem, separated by a deep constriction from the old frond. As yet this lobe is quite entire; but after a while longitudinal splits, commencing near its margin, and continuing towards its centre begin to appear. These widen and lengthen by degrees, and at last the outer ones reach the decaying base of the old frond; a rupture ensues, and the tip of the new segment is free. This process is continued, until, when many segments have thus been formed, the connection between the old leaf and the now nearly perfect new one is so much weakened, that the former adheres by a very small surface, and is soon cast off altogether. Our figure is taken from a specimen in which this is about to take place.

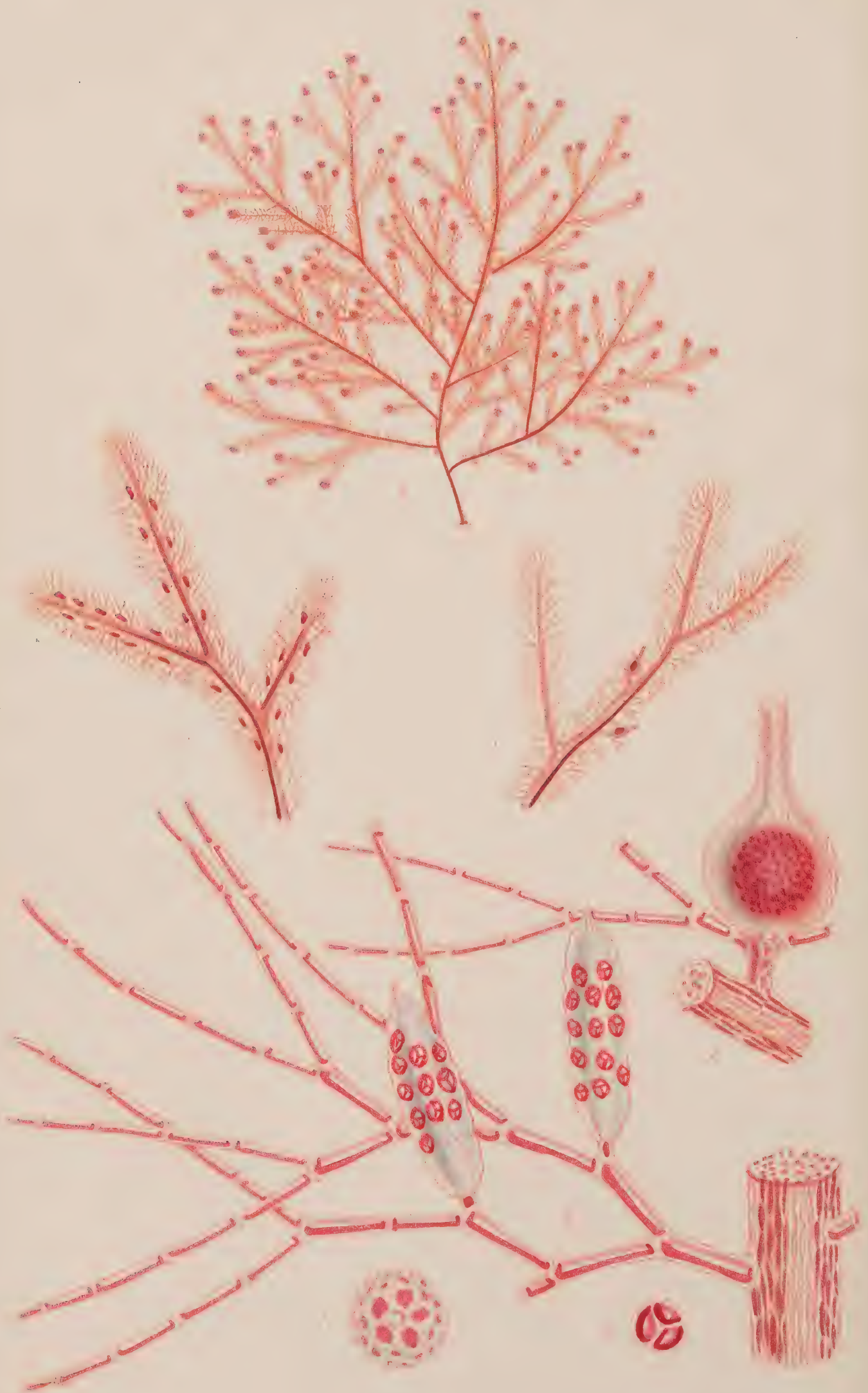
This mode of growth appears common to all the *Laminariæ*, in many of which Mrs. Griffiths has been the first to observe it; and I take this opportunity of expressing my warmest thanks to that lady for a magnificent suite of the present species, exhibiting the growing frond in all stages of its developement.

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Fig. 1. Plant of *LAMINARIA DIGITATA*, (small), just before casting the frond of the previous season. 2. Young seedling plant:—*both of the natural size*. 3. Section of the frond, with spores and air cells *in situ*. 4. Spores:—*both magnified*.

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## PLATE CCXXIV.

DASYA ARBUSCULA, *Ag.*

GEN. CHAR. *Frond* filamentous; the *stem* and *branches* mostly opaque, irregularly cellular (rarely pellucid, longitudinally tubed), composed internally of numerous parallel tubes surrounding a central cavity; the *ramuli* jointed, single tubed. *Fructification* two-fold, on distinct plants; 1, ovate *capsules* (*ceramidia*) furnished with a terminal pore, and containing a tuft of pear-shaped spores; 2, lanceolate *Pods* (*stichidia*), containing *tetraspores* ranged in transverse bands. DASYA (*Ag.*), from *δαρς*, hairy.

DASYA *arbuscula*; stems much and irregularly branched, beset on all sides with short, divaricating, dichotomous ramuli, scarcely tapering upwards; articulations from two to four times longer than broad; apices spreading, rather obtuse; stichidia elliptic-oblong, mucronate; ceramidia urceolate, with a long, cylindrical neck.

DASYA *arbuscula*, *Ag. Sp. Alg.* vol. ii. p. 121. *J. Ag. Symb.* p. 33. *J. Ag. Alg. Medit.* p. 118. *Harv. Man.* p. 98. *Endl. 3rd Suppl.* p. 44. *Mont. Ann. Sc. Nat.* vol. xv. p. 173.

DASYA *Hutchinsiae*, *Harv. in Hook. Br. Fl.* vol. ii. p. 335. *Harv. in Mack. Fl. Hib.* part 3. p. 210.

CERAMIUM *Boucheri*, *Duby, 2nd Mem.* p. 15. *Crouan, in Desm. Pl. Crypt.* no. 302 and 303.

CONFERVA *arbuscula*, *Dillw. t. G.* (but not t. 85).

HAB. On rocks, at the verge of low water-mark; a more slender variety frequently dredged in from four to six or eight fathoms water. Annual. Summer. Not uncommon on the shores of the West of Ireland, and the North and West of Scotland. Particularly fine in Bantry Bay, *Miss Hutchins.* Rare in England. Salcombe, and the Land's End, *Mr. Ralfs.* Mewstone, Plymouth, *Rev. W. S. Hore.*

GEOGR. DISTR. Atlantic Shores of France and Spain. Mediterranean Sea.

DESCR. *Root*, a small disc. *Fronds* from one to three or four inches high, as thick as hog's bristles, irregularly much branched in a manner between alternate and dichotomous; sometimes all the main divisions are pretty regularly dichotomous; sometimes regularly alternate; the lesser branches are generally alternate, much crowded to the apices, and decompound above, the whole habit of the plant being strikingly bushy. *Stem* and *branches* opaque, inarticulate, marked with irregular cells. *Ramuli* densely covering all parts of the frond except the older parts of the stem, directed to every side, one to two lines long, somewhat rigid, of nearly equal diameter throughout, divaricate, several times forked, the axils patent, articulate, their articulations from two to four times longer than broad, cylindrical. *Ceramidia* (rather rarely formed) borne on short, inarticulate peduncles, surrounded by a few jointed ramuli, roundish-urceolate, the apex produced

into a long cylindrical neck ; spores minute, of various shapes, densely crowded into a spherical mass. *Stichidia* borne on the ramuli, elliptic-oblong, with a sharp point, laxly cellular, containing three or four rows of roundish tetraspores. *Tubes* in the stem five, surrounding a cavity. *Substance* rather crisp, becoming soft on exposure, and closely adhering to paper in drying. *Colour* variable ; sometimes clear crimson-lake ; at other times more or less tinted with brown or yellow, and sometimes dark brown. In all cases the frond discharges a fine crimson powder on maceration in fresh water.

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This pretty plant was originally discovered by Messrs. Hooker and Borrer on the shores of the Orkney Islands, and has been found at various places along the western shores of Britain, to the extremity of the Land's End. Its most abundant stations, are on the west of Ireland, in several bays of which coast it reaches a large size. On the Continent it has been found along the coasts of France and Spain, and in the Mediterranean.

There are two principal varieties of this species ; one of them found on rocks near low-water mark, the other dredged in deeper water, and often on a sandy or shingly bottom, or among *Zostera*. In the first, which is represented in our figure, the frond is more robust and bushy, the branches more regularly alternate, and the colour frequently very dark. But this last character varies according to minor circumstances of each locality. This variety is frequently found in fruit, the *Pods* being more commonly found than the *capsules*. In the second variety the stems are more slender, the branches much divaricated, and the order of branching more or less dichotomous, while the ramuli are less dense, and more squarrose, and so far as I know, always barren. At first sight such specimens might pass for a different species, but there are innumerable intermediate forms.

The *D. scoparia* of the Cape of Good Hope, and *D. collabens* of New Zealand nearly resemble this species in habit, but differ by some seemingly essential characters.

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Fig. 1. *DASYA ARBUSCULA* :—*of the natural size*. 2. A branch bearing *stichidia*. 3. Ramulus from the same, with two *stichidia*. 4. Tetraspore. 5. Branch bearing *ceramidia*. 6. A *ceramidium* from the same, on its stalk. 7. Transverse section of the stem :—*all more or less magnified*.

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## PLATE CCXXV.

DASYA VENUSTA, *Harv. (n. sp.)*


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GEN. CHAR. *Frond* filamentous; the *stem* and *branches* mostly opake, irregularly cellular (rarely pellucid, longitudinally tubed), composed internally of numerous parallel tubes surrounding a central cavity; the *ramuli* jointed, single tubed. *Fructification* two-fold, on distinct plants; 1, ovate *capsules* (*ceramidia*) furnished with a terminal pore, and containing a tuft of pear-shaped spores; 2, lanceolate *Pods* (*stichidia*) containing *tetraspores* ranged in transverse bands. DASYA (*Ag.*), —from *δαρς*, hairy.

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DASYA *venusta*; frond pyramidal, decompoundly pinnate; the branches clothed with exceedingly slender, flaccid, many times dichotomous, attenuated ramuli; articulations five or six times longer than broad; stichidia pedicellate, ovoid, much acuminate; ceramidia ovate-urceolate, with a protruding mouth.

DASYA *venusta*, *Harv. in Herb. T. C. D.*

HAB. Cast on shore. Annual. Summer and Autumn. Very rare.

Discovered on the shores of Jersey, by *Miss White* and *Miss Turner*.

GEOGR. DISTR. — ?

DESCR. *Root*, a small disc. *Stem* three or four inches long, as thick as hog's bristles, undivided, but furnished throughout with numerous alternate, lateral branches, the lowest of which are longest, the rest gradually shorter towards the apex. *Branches* undivided like the stem, and like it furnished with a second series of lesser branches which likewise diminish in length towards the extremities; these again, in large specimens, bear a third series; each set being smaller and more slender than the preceding. The main stem is generally bare of ramuli; but all the branches and their divisions are clothed with very slender and flaccid, jointed ramuli, one or two lines in length, and very many times dichotomous: these rapidly diminish in diameter at each successive forking, and at length are reduced to cob-web thinness at the extremities. *Axils* acute. *Articulations* cylindrical, five or six times as long as broad. *Ceramidia* borne on short, inarticulate peduncles, surrounded by a few jointed ramuli, ovate-urceolate, gradually tapering into a conical neck, containing a dense, globose mass of small spores. *Stichidia* borne on the ramuli, pedicellate, ovate, much acuminate, with a long acute point, containing three or four rows of roundish tetraspores. *Substance* very tender and flaccid, strongly adhering to paper in drying. *Colour*, a fine crimson-lake. In fresh-water it gives out a crimson powder.—Sometimes the ramuli are tipped with linear-lanceolate, pod-like bodies, full of minute granules; apparently *antheridia* (fig. 4).

In the year 1846 I received from Miss White a small specimen of this plant, which at that time I laid aside, as a variety of *D. ar-*



*buscula*; and a short time afterwards Miss Turner supplied me with a fine specimen that at once convinced me that the plant was different from *D. arbuscula*, but left me in doubt whether it ought not to be referable to the *D. corymbifera* of J. Agardh. Of that species I possess a small morsel on talc, and as far as I can decide from an imperfect fragment, our plant is different; and it is also abundantly different from any other *Dasya* with which I am acquainted. In the byssoid fineness of its ramuli it approaches *D. elegans*, but differs in habit and in the form of its *stichidia* and *ceramidia*. The habit of our new plant is indeed rather that of *Pol. byssoides* or of *Seirospora Griffithsiana* than of any *Dasya* known to me, and may be said to be intermediate in aspect between those two beautiful plants. The conical outline is very characteristic; but it is on the extreme slenderness and repeated division of the ramuli, and the shape of the *stichidia* that I chiefly rely for its diagnosis.

I am much indebted to Miss White and Miss Turner for specimens of Jersey Algæ, and I would willingly discharge a portion of the debt by inscribing the present beautiful plant with the name of its fair discoverer, could I determine to which of the ladies the merit belongs. But as this point is doubtful, I have chosen a specific name which is at the same time descriptive of the elegance and grace of the plant and, in its derivation, allusive to the fairer portion of creation in general.

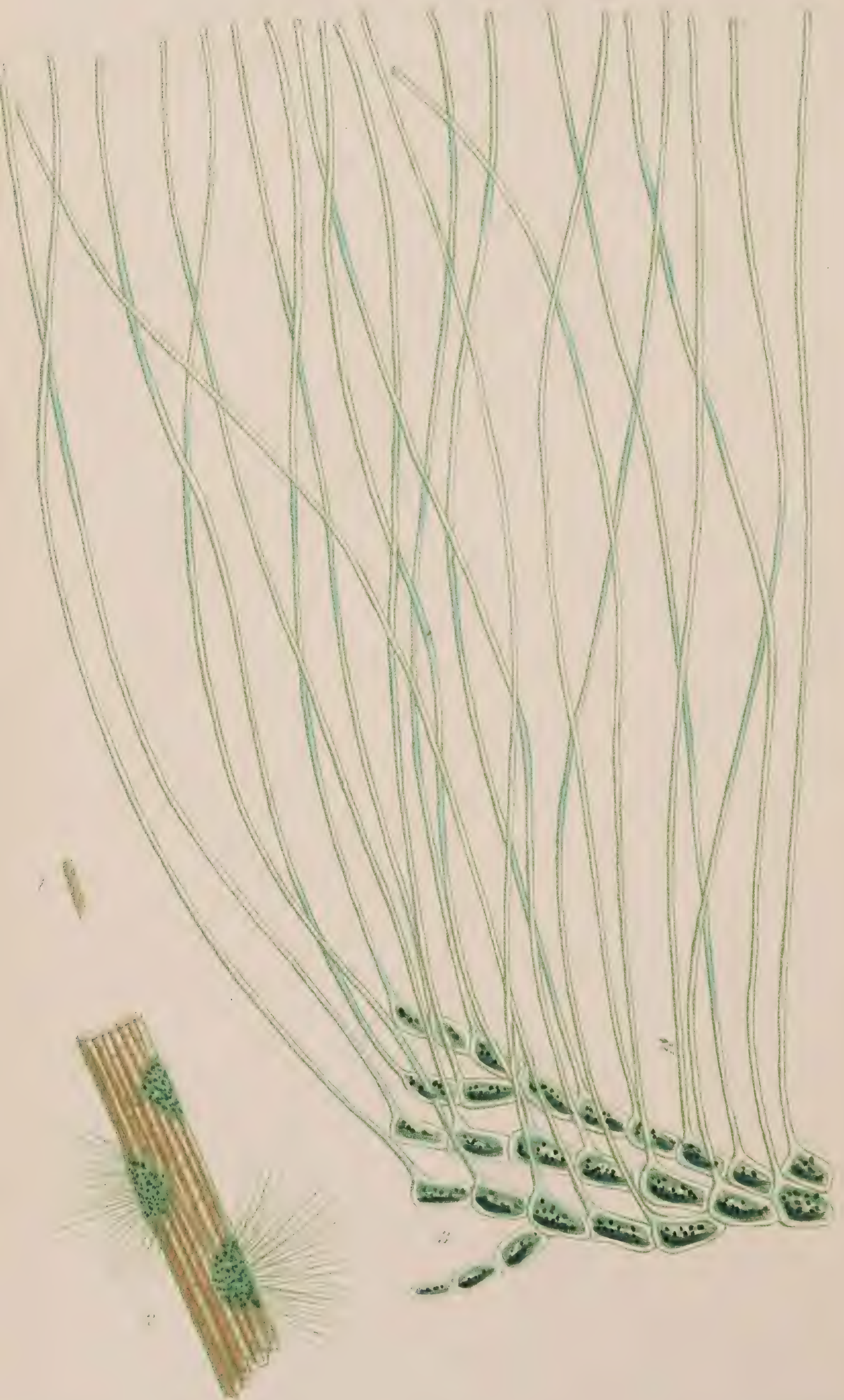
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Fig. 1. *DASYA VENUSTA*; the *natural size*. 2. A ramulus bearing *stichidia*. 3. A *ceramidium* on its stalk. 4. Apex of a ramulus, bearing *antheridia*:—all highly *magnified*.

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## PLATE CCXXVI.

OCHLOCHÆTE HYSTRIX, *Thw. MSS.*

GEN. CHAR. *Fron*d disciform, adpressed. Filaments cylindrical, radiating from a central point, irregularly branched, consisting of a single series of cells, each of which is most commonly produced above into a rigid inarticulated seta. *Endochrome* green. *Fructification* unknown. OCHLOCHÆTE (*Thw., MSS.*)—from ὄχλος, a *multitude*, and χείρη, a *bristle*.

OCHLOCHÆTE *Hystrix*; plant very minute, pale green, hoary from its numerous rigid setæ.

HAB. On stems of grasses &c., in a lake of brackish water, called "The Little Sea," near Wareham, Dorset, *Rev. W. Smith*; also in fresh-water ditches near Bristol, upon the leaves of mosses; very rare. *G. H. K. Thwaites*.

DESCR. *Plant* disciform, frequently irregular in its outline, very minute, pale green, hoary from the multitude of rigid setæ with which it is covered. *Filaments* closely adpressed and adhering firmly to the substance on which the plant may be growing; radiating from a central point, irregularly branched, and frequently cohering laterally. *Cells* oblong, each usually furnished with a very long rigid tubular diaphanous seta. *Endochrome* granular, green. The fructification has not been observed. It is possible that the fresh-water specimens from the neighbourhood of Bristol may prove specifically distinct from the Wareham plant.

For the present we have placed *Ochlochæte* with the *Chætophoreæ*, from which family, however, it will eventually have to be removed, since it differs from *Chætophora* (that is, the typical species *C. elegans*,\* *Ag.*) and *Draparnaldia* in some important

\* *Chætophora elegans*, *Ag.* in the state of fruit is evidently the *Gongrosira sclerococcus* of Kützing, whilst the same species with *opseospermata* appears to be the *Chætophora longæva* of Carmichael. From the inspection of an authentic specimen of *Chætophora pisiformis*, *Ag.*, kindly given to me by my friend, the *Rev. M. J. Berkeley*, I have ascertained that this species is by no means congeneric with *C. elegans*, *Ag.*, but has the fruit and setæ of *Coleochæte*, from which genus it would seem to be separated only by its erect, free, not adpressed filaments: and there can be little doubt, therefore, that *Chætophora tuberculosa*, *Ag.*, is equally allied to *Coleochæte*. *Chætophora Berkeleyi* of *Dr. Greville*, and *C. pellita*, *Lyngbye*, have already been figured in the present work under the names respectively of *Leathesia Berkeleyi*, *Harv.*, and *Cruoria pellita*, *Fries*; the former being closely allied to *Elachistea*, especially to *E. scutulata*, *Fries*; and the latter having an affinity rather with the *Nostochineæ*.—*Thwaites*.



particulars. The genera *Ochlochæte*, *Bulbochæte*, and *Coleochæte*, are very closely allied to *Tiresias*, Bory, (*Ædogonium*, Link ; *Vesiculifera*, Hassall,) and bear the same relation to it that *Draparnaldia*, *Chætophora*, and *Stygeoclonium* do to the genus *Ulothrix*, of Kützing, (*Sphæroplea*, Berk., *Lyngbya*, Hassall). In the former of these two groups of plants the setæ, when present, are rigid continuous tubes ; and the fruit, so far as has been observed, is not contained within an original cell of the filament, but each *sporangium* is in a new cell, formed, it is true, by the elongation of an original cell, but subsequently separated from it by a septum : this occurs in *Tiresias*, *Bulbochæte*, and *Coleochæte*. In *Draparnaldia*, on the contrary, and its immediate allies the diaphanous prolongations of the filaments are septate, each consisting of a series of elongated cells. The *sporangia*, also, in *Draparnaldia glomerata*, Ag., and *Chætophora elegans*, Ag., in which species we have observed them, are formed within the original cells of the ramuli, causing the latter to assume a moniliform appearance. Quaternate *opseospermata*, which are most probably gemmæ, likewise occur in these species, as well as in those of the genus *Stygeoclonium* of Kützing.

[I am indebted to Mr. Thwaites for the above description, and for a beautiful figure from which our plate has been prepared.—*W.H.H.*]

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Fig. 1. Fronds of *OCHLOCHÆTE HYSTRIX* :—*natural size*. 2. The same, *magnified*. 3. Small portion of a frond :—*very highly magnified*.

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## PLATE CCXXVII.

POLYSIPHONIA SUBULIFERA, *Ag.*

GEN. CHAR. *Frond* filamentous, partially or generally articulate; joints longitudinally striate, composed of numerous radiating cells or tubes, disposed round a central cavity. *Fructification* two-fold, on different individuals; 1, ovate *capsules* (*ceramidia*), furnished with a terminal pore, and containing a tuft of pear-shaped spores; 2, *tetraspores*, imbedded in swollen branchlets. POLYSIPHONIA (*Grev.*),—from *πολυς*, *many*, and *σιφων*, a *tube*.

POLYSIPHONIA *subulifera*; filaments setaceous, quickly becoming flaccid, flexuous, irregularly much branched; branches alternately decompounded, spreading, the lesser divisions long and rod-like; ramuli scattered, patent, subulate, simple or rarely bi-multifid; articulations visible in all parts of the frond, variable in length, many striate; tubes about thirteen, containing a coloured bag, and surrounding a narrow cavity.

POLYSIPHONIA *subulifera*, *Harv. in Hook. Journ. Bot. 1st Series*, vol. i. p. 301. *Wyatt, Alg. Danm.* no. 178. *Harv. Man.* p. 86. *Endl. 3rd Suppl.* p. 46 (no. 96).

HUTCHINSIA *subulifera*, *Ag. in Bot. Zeit.* 1827, p. 638. *Ag. Sp. Alg.* vol. ii. p. 97.

HAB. Dredged in four to five or ten fathoms water, generally on Nullipore banks. Annual. Summer. Torquay, very rare, *Mrs. Griffiths*. Weymouth, “parasitical on *Rytiphlea pinastroides* and *Polyides rotundus*, between tide-marks,” *Miss White*. Belfast Bay, *Mr. Templeton*. Carrickfergus and Roundstone, at the latter place very abundant, *Mr. McCalla*.

GEOGR. DISTR. Adriatic Sea, *Agardh*. Coast of France, *Lenormand*!

DESCR. *Root* a disc, generally accompanied by grasping fibres, or else small discs rising from the lowest parts of the stems and branches. *Fronds* densely tufted, from four to six or eight inches in length, as thick as, or somewhat thicker than, hog’s bristle, gradually attenuated to a point, much and irregularly branched. Main divisions irregularly forked, soon breaking up into a multitude of branches, which stand out from each other towards every side, and are repeatedly divided alternately. Lesser branches frequently long, rod-like, and subsimple, set, like the larger divisions, with short, awl-shaped, spine-like scattered ramuli. These ramuli are one or two lines long, patent, acute, and generally simple. In a young state all the apices terminate in colourless, byssoid fibres. *Articulations* varying much in length in different specimens and in different parts of the same specimen; sometimes nearly uniformly as long as broad, sometimes twice or thrice as long, many tubed. *Tubes* in the stem thirteen. *Substance* at first crisp, but quickly growing flaccid in the air. *Colour* a dark full red,

becoming brown, and sometimes even black in drying. In fresh water this plant gives out a dark brown liquid. I have never seen fructification of either kind.

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This species, though sometimes found, as at Weymouth, between tide-marks, much more commonly grows at a considerable depth, so as to escape notice altogether, except when accidentally thrown ashore after storms, or when sought by dredging. It was first described by Agardh, who gathered specimens of it at Venice, but had been found many years previously by the late Mr. Templeton, in Belfast Lough. In the herbarium of that gentleman, the specimens remained undescribed until 1840, when I recognised them, and introduced that Irish habitat into the Manual. *P. subulifera* had, however, previously, in 1833, been found in England by Mrs. Griffiths and Mr. Borrer. It appears to be much more abundant on the coast of Ireland, especially in Roundstone bay, where, on different occasions, I have dredged it in considerable quantities.

Its peculiar thorny habit, well expressed by the specific name, is so unlike that of any other British species of equal size, that it cannot well be confounded with any. To the naked eye it bears a greater resemblance to young specimens of *Rytiphlæa fruticulosa* than to anything else, but is more slender and flaccid, and readily known at all times by the distinctly articulate stem and branches, which have, both externally and internally, a very different structure.

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Fig. 1. POLYSIPHONIA SUBULIFERA:—*of the natural size.* 2. Portion of a branch. 3. Joints and ramulus from the same. 4. Transverse section of the stem:—*all more or less magnified.*

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## PLATE CCXXVIII.

POLYSIPHONIA GRIFFITHSIANA, *Harv.*

GEN. CHAR. *Frond* filamentous, partially or generally articulate; joints longitudinally striate, composed of numerous radiating cells or tubes, disposed round a central cavity. *Fructification* two-fold, on different individuals; 1, ovate *capsules* (*ceramidia*), furnished with a terminal pore, containing a mass of pear-shaped spores; 2, *tetraspores* imbedded in swollen branchlets. POLYSIPHONIA (*Grev.*),—from *πολυς*, *many*, and *σιφων*, a *tube*.

POLYSIPHONIA *Griffithsiana*; stem rigid, attenuated, alternately branched; branches long, patent, subsimple, furnished with numerous subdichotomous or alternately divided, slender, patent, flaccid ramuli; articulations of the stem, branches, and ramuli about once and a half or rarely twice as long as broad, with straight tubes; siphons in the stem four, with four alternate secondary ones; capsules broadly ovate, sessile.

POLYSIPHONIA *Griffithsiana*, *Harv. Man.* p. 91.

HAB. On the smaller Algæ between tide-marks. Annual. September. Parasitical on *Polyides rotundus* at Torquay, *Mrs. Griffiths*. Isle of Portland, *Miss White*.

GEOGR. DISTR. South coast of England.

DESCR. *Root* a small disc. *Fronde*s laxly tufted, four to five inches long, and nearly as much in expansion. *Stem* undivided, set throughout its length with alternate, spreading branches, the lowest of which are longest, the rest gradually shorter upwards, giving the whole frond a pyramidal outline. *Branches* like the stem, beset with a second and third series of alternate lesser branches, the last of which are more or less furnished with dichotomous, flaccid, slender ramuli. All parts of the frond are conspicuously jointed; the articulations of the stem are from one and a half to twice as long as broad, marked with about five tubes, two of which are much narrower than the rest; those of the branches are about once and a half as long as broad, with two tubes only. A transverse section of the stem shows four primary and four secondary tubes. *Ceramidia* ovate, sessile, scattered on the ramuli. *Colour* a full red, inclining to brownish in drying but not much altered by fresh water. *Substance* rather rigid in the stem and branches, flaccid in the ramuli.

An elegant plant with a good deal the habit of small specimens of *P. violacea*, but known at once from that species by the distinctly jointed stem marked by straight tubes. It moreover resists the action of fresh water for a longer time, and the colour is also different. Some specimens of *P. elongella* have a slight look of

our plant, but usually their peculiar ramification sufficiently marks these species.

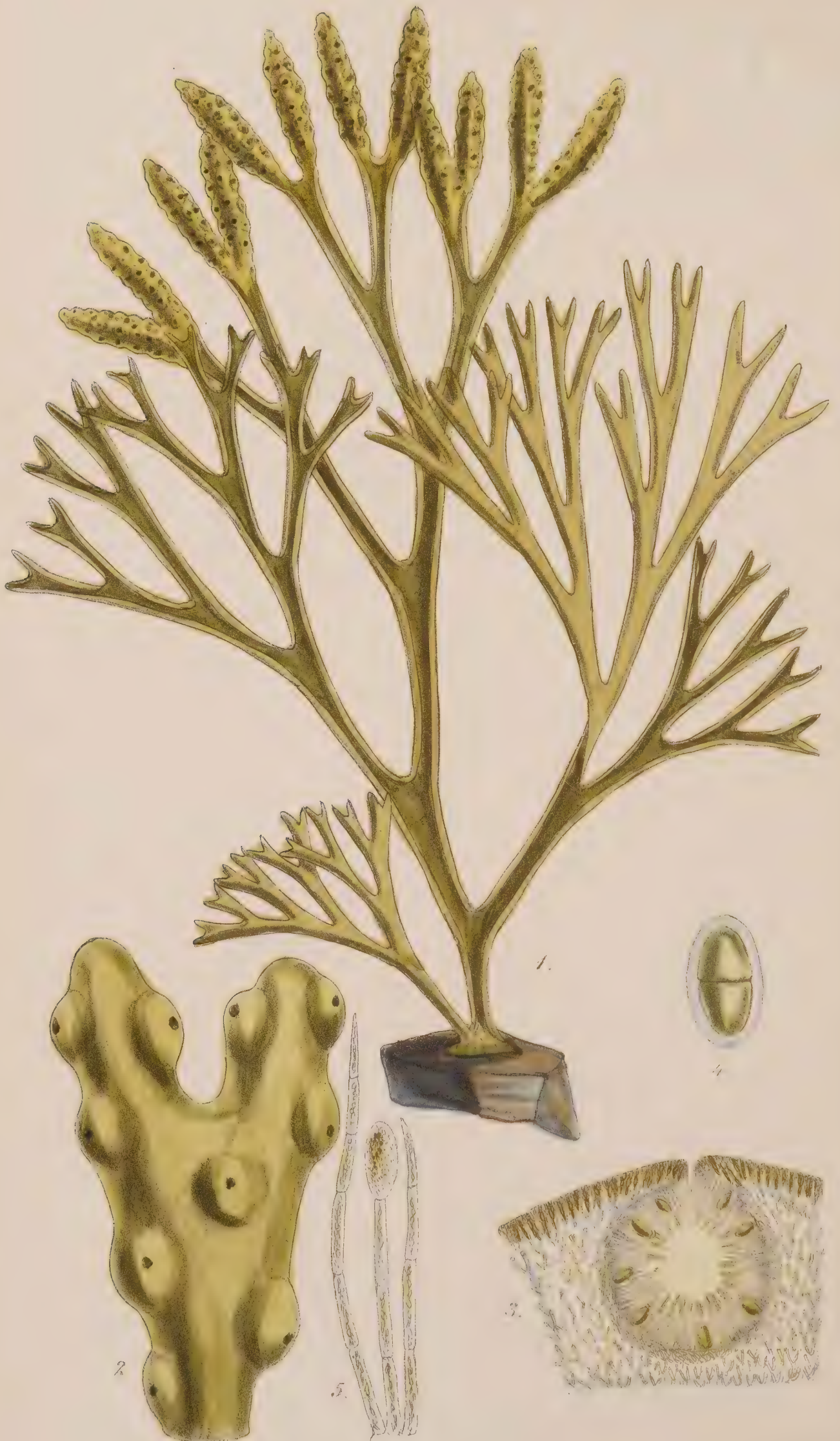
*P. Griffithsiana* was discovered by Mrs. Griffiths in 1837, and has not since been found at Torquay. But I have had the satisfaction of receiving a specimen from Miss White from the Isle of Portland, agreeing in all essential characters with the Torquay plant. I have not compared either with continental specimens, and possibly this plant may be found under some other name in the works of continental botanists. As far as we yet know, however, it is confined to the south shores of England.

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Fig. 1. POLYSIPHONIA GRIFFITHSIANA :—*of the natural size.* 2. One of the secondary branches and portion of a primary branch. 3. *Ceramidium* attached to a ramulus. 4. Joints from the stem. 5. Transverse section of the stem :—*all more or less magnified.*







## PLATE CCXXIX.

FUCUS CANALICULATUS, *Linn.*

GEN. CHAR. *Fron*d linear, either flat, compressed, or cylindrical, dichotomous (rarely pinnated), coriaceous. Air-vessels, when present, innate, simple. *Receptacles* either terminal or lateral, filled with mucus traversed by a net-work of jointed fibres, pierced by numerous pores, which communicate with immersed, spherical conceptacles, containing parietal *spores* or *antheridia*, or both. FUCUS (*L.*),—from *φυκος*, a sea-weed.

FUCUS *canaliculatus*; frond linear, narrow, channelled on one side, without mid-rib or air-vessels, dichotomous; receptacles terminal, bipartite.

FUCUS *canaliculatus*, *Linn. Syst. Nat.* vol. ii. p. 716. *Fl. Dan.* t. 214. *Gm. Hist.* p. 73. t. 1. A. f. 2. *Lightf. Fl. Scot.* p. 917. *Velley*, t. 1. *With.* vol. iv. p. 99. *Turn. Syn.* p. 242. *Turn. Hist.* t. 3. *Sm. E. Bot.* t. 823. *Lamour. Ess.* p. 20. *Lyngb. Hyd. Dan.* p. 6. t. 1. *Ag. Sp. Alg.* vol. i. p. 96. *Ag. Syst.* p. 279. *Hook. Fl. Scot.* part 2. p. 96. *Grev. Fl. Edin.* p. 284. *Grev. Alg. Brit.* p. 18. *Hook. Br. Fl.* vol. ii. p. 268. *Harv. in Mack. Fl. Hib.* part 3, p. 169. *Harv. Man.* p. 21. *Wyatt, Alg. Danm.* no. 102. *Kütz. Phyc. Gen.* p. 352.

FUCUS *excisus*, *Linn. Sp. Pl.* p. 1627. *Mant.* p. 508. *Fl. Lapp.* p. 366. *Gunn. Fl. Norv.* vol. i. p. 96.

PELVETIA *canaliculata*, *Dne. An. Sc. Nat.* 1845, p. 12.

FUCODIUM *canaliculatum*, *J. Ag. Sp. Alg.* vol. i. p. 204.

HAB. On rocky sea-shores, between high-water mark and half-tide level. Perennial. Summer and autumn.

GEOGR. DISTR. Atlantic shores of Europe and North America.

DESCR. *Root*, a conical expansion, half an inch or more in diameter. *Fron*ds densely tufted, from two to six inches or more in height, one to two or three lines in breadth, nearly of equal breadth throughout, deeply channelled on one side, and rounded on the other, many times dichotomous in a tolerably regular manner; the apices generally bifid. *Receptacles* terminating the branches, narrow-cuneate, either deeply cloven or bipartite, swollen, tubercular, containing numerous immersed conceptacles. *Spores* elliptical, at length separating, by a transverse division, into two sporules. *Substance* very tough and leathery. *Structure* dense. *Colour*, a clear olive when young, becoming brownish or foxy in old age, the receptacles at length greenish-yellow.

This species begins to vegetate on the very edge of high-water mark, often in places where it is only wet by the spray. In such situations it attains a dwarfish size, seldom reaching more than an inch or two in height, but the specimens sometimes arrive at



maturity and produce fruit. Between this, its extreme limit, and the level of half-tide, the main crop is developed, the fronds attaining a greater size with the increasing depth of water; but beyond half-tide we rarely, if ever, meet with *Fucus canaliculatus*. It evidently requires by its organization, exposure to the atmosphere for a considerable period each day. Unlike most of its congeners it rarely covers wide spaces of rock, but more commonly grows in scattered tufts in places where, on the recess of the tide, the water rapidly drains off. It thus shows, in all its habits, a peculiar adaptation for drought, and its tough and close texture admirably fit it for long resisting the drying effects of sun and air. Still, it often becomes quite dry and crisp in a hot summer's day, and yet recovers life and flexibility on the return of the tide. None of our marine plants are less variable in character. Its channelled stem is always recognisable, and its ramification, if the frond be not injured, is invariably dichotomous. In cases of accidental injury, however, the wounded parts become proliferous and throw out numerous branches without order, converting such specimens into dense bushes.

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Fig. 1. *FUCUS CANALICULATUS* :—*of the natural size*. 2. Part of a receptacle, with its immersed conceptacles. 3. Section of portion of the same, one of the conceptacles cut through. 4. A spore. 5. Some of the filaments which accompany the spores :—*all more or less highly magnified*.

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## PLATE CCXXX.

CALLITHAMNION ROSEUM, *Lyngb.*

GEN. CHAR. *Fronde* rosy, or brownish-red, filamentous; stem either opaque and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds on distinct plants; 1, external *tetraspores*, scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like receptacles (*favellæ*), seated on the main branches, and containing numerous, angular spores. CALLITHAMNION (*Lyngb.*),—from *καλος*, *beautiful*, and *θαμνιον*, *a little shrub*.

CALLITHAMNION *roseum*; stems much and loosely branched; secondary branches long, flexuous, subdistichously plumulate; plumules lax, with a roundish outline, crowded towards the tops of the branches, simply pinnate; pinnæ long, spreading, curved; articulations of the stem and branches four and five times as long as broad, more or less filled with veins; those of the pinnæ twice or thrice as long as broad; tetraspores elliptical, four or five on each pinna, from the lower joints; favellæ tufted.

CALLITHAMNION *roseum*, *Lyngb. Hyd. Dan.* p. 126. t. 39 (?). *Ag. Sp. Alg.* vol. ii. p. 164. *Harv. in Hook. Br. Fl.* vol. ii. p. 341. *Harv. in Mac. Fl. Hib.* part 3. p. 214. *Harv. Man.* p. 106. *Wyatt, Alg. Danm.* no. 44. *Endl. 3rd Suppl.* p. 34.

PHLEBOTHAMNIUM *roseum*, *Kütz. Phyc. Gen.* p. 375. t. 44. f. 1.

CERAMIUM *roseum*, *Roth, Cat. Bot.* vol. iii. p. 145. *Ag. Syst.* p. 139.

CONFERVA *rosea*, *E. Bot.* t. 966. *Dillw.* t. 17 (? ?).

HAB. On rocks and the larger *Fuci*, near low-water mark; frequently in æstuaries, or muddy places. Annual. Summer. Not uncommon.

GEOGR. DISTR. Atlantic shores of Europe.

DESCR. *Fronde*s densely tufted, three or four inches long. *Stems* as thick as hog's bristle at the base, in young plants pellucid, but in old, opaque and full of veins, or internal fibres, excessively branched and bushy; the branches alternate, repeatedly divided. Lesser branches somewhat virgate, set throughout their length, at nearly every joint, with alternate simply pinnated plumules, of roundish or ovate outline. *Pinnæ* long, more or less incurved, either quite simple, or furnished with one or two small pinnulæ near the apex. *Articulations* of the stem and branches four or five times as long as broad, or more, somewhat swollen at the joints; those of the lesser branches and ramuli gradually shorter. *Endochrome* nearly filling the tube. *Tetraspores* elliptical, sessile on the inner faces of the pinnæ, one at each of the four or five lowermost joints. *Favellæ* generally terminating truncated branches, two or more together: sometimes several united in a berry-like mass. *Colour* in young specimens a fine purple-lake, in old brownish, becoming brighter in fresh-water. *Substance* membranaceous and soft, closely adhering to paper, but not gelatinous.

*Callithamnion roseum* is one of the longest described of the genus, and ought therefore, one would think, to be the best known. But, as with many old species, several plants which are now distinguished, were formerly confounded under this name, and thus it becomes a doubtful matter to which of the modern species the original synonyme *roseum* attaches. The species was first defined by Roth in his *Catalecta*. I have seen no specimen of the plant of this author, and the *type* which I have adopted, and here figure, is derived from a specimen received from Mr. Dawson Turner, and compared many years ago by that gentleman with Roth's plant, and from another sent by Mr. Borrer, as the plant of English Botany. These two specimens agree with each other and also with the specimens published by Mrs. Wyatt, in *Algæ Danmonienses*. As far, therefore, as the British flora is concerned, our notions of *Cal. roseum* are tolerably definite. It would be very desirable were our plant compared with the herbaria of continental authors.

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Fig. 1. *CALLITHAMNION ROSEUM*:—*of the natural size*. 2. A pair of plumules and three articulations of a branch. 3. Part of a pinna, with tetraspores. 4. A small branch, bearing a cluster of favellæ. 5. Binate favellæ. 6. Joints from the lower part of the stem:—*all more or less highly magnified*.

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## PLATE CCXXXI.

CALLITHAMNION POLYSPERMUM, *Ag.*

GEN. CHAR. *Fronde* rosy, or brownish-red, filamentous; stem either opaque and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds on distinct plants; 1, external *tetraspores*, scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like receptacles (*favellæ*), seated on the main branches, and containing numerous, angular spores. CALLITHAMNION (*Lyngb.*),—from *καλος*, *beautiful*, and *θαμνιον*, a *little shrub*.

CALLITHAMNION *polyspermum*; tufts globose; filaments slender, delicate, loosely much-branched, irregularly divided below, distichously plumulate above; plumules long and narrow, simply pinnate; pinnæ short, simple, patent, acute, spine-like; articulations of the branches with a very narrow coloured tube, four or five times as long as broad, of the ramuli short; tetraspores globose, lining the inner face of the pinnæ.

CALLITHAMNION *polyspermum*, *Ag. Sp. Alg.* vol. ii. p. 169. *Harv. in Hook. Br. Fl.* vol. ii. p. 342. *Harv. in Mack. Fl. Hib.* part 3. p. 214. *Harv. Man.* p. 108. *Wyatt, Alg. Danm.* no. 140. *Endl. 3rd Suppl.* p. 34.

CALLITHAMNION *Grevillii*, *Harv. in Hook. Br. Fl.* vol. ii. p. 345. *Harv. Man.* p. 110. *Harv. in Mack. Fl. Hib.* part 3. p. 215.

CALLITHAMNION *roseum*, *Grev. Fl. Edin.* p. 311 (*not of Br. Fl.*)

CALLITHAMNION *purpurascens*, *Johnst. Berw. Fl.* vol. i. p. 240.

PHLEBOTHAMNIUM *polyspermum*, *Kütz. Phyc. Gen.* p. 374.

HAB. On various Algæ between tide-marks, frequently on *Fucus vesiculosus* and *F. serratus*. Annual. Summer. All round the coast.

GEOGR. DISTR. Atlantic shores of Europe.

DESCR. *Root* discoid, small. *Tufts* globose, one to three inches in diameter, dense. *Filaments* capillary, excessively branched; *stem* zigzag, with short articulations, traversed by a few fibres but not thereby rendered opaque, irregularly divided, and either somewhat bare or well furnished with alternate, secondary branches. *Branches* long and slender, zigzag, bearing a second or third series, the latter alternately plumulate with considerable regularity. *Plumules* usually long and narrow, simply pinnate, or occasionally the upper part more compound. *Pinnæ* usually short, patent, subulate, sometimes recurved, in luxuriant specimens so far lengthened that the outline of the plumule becomes ovate. *Articulations* of the branches 4–5 times as long as broad, with a very narrow bag of endochrome; of the ramuli twice as long as broad, fully coloured. *Tetraspores* usually lining the inner faces of the pinnæ, globose. *Favellæ* of large size, in dense clusters, bursting from the rachis of a distorted plumule. Occasionally the place of tetraspores is occupied by round bodies (antheridia? or rather viviparous tetraspores) formed of innumerable minute cells, strung together. *Colour*,

a brownish red, sometimes purplish. *Substance* membranaceous, adhering to paper. On being re-moistened, the frond exhales the odour of violets.

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A common species, but variable in its characters, and gradually approaching *C. roseum* on the one hand, and *C. Hookeri* on the other. Our plate represents what we regard as the typical form, or *idea*, of the species. It is remarkable for the short, awl-shaped, simple pinnæ, beaded, on the inner face, with globose tetraspores. From this I formerly distinguished *C. Grevillii* by a plumule of broader and shorter outline, whose uppermost pinnæ were pin-nulate at top. A more intimate acquaintance with the species of this genus, and an examination of a profusion of specimens exhibiting numerous variations from the original type of *C. polyspermum*, but all more referable to it than to any other species, have made me cautious of admitting the value of the characters I had formerly considered belonging to *C. Grevillii*. I now regard that species therefore as an imperfectly developed form of *C. polyspermum*, whose uppermost pinnæ are passing into the state of plumules.

*C. polyspermum* more frequently grows on the coarser *Fuci* than any other species, and sometimes clothes them with densely set, globose tufts, which in old age become blended together, concealing the greater part of the plant on which they grow. The finest specimens I have received were collected at Mount Edgecombe, by my liberal Plymouth correspondents, Messrs. Hore, Rohloff, and Cocks.

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Fig. 1. CALLITHAMNION POLYSPERMUM :—*of the natural size.* 2. Portion of a branch, with four plumules. 3. Pinnæ with tetraspores. 4. Plumule with favellæ. 5. Favellæ detached. 6. Pinna with antheridia? 7. Joints from a branch. 8. Joints from the lower part of the stem :—*all more or less magnified.*

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## PLATE CCXXXII.

GIGARTINA PISTILLATA, *Lamour*.

GEN. CHAR. *Fronde* cartilaginous, either filiform, compressed or flat, irregularly divided, purplish red; the *axis*, or central substance, composed of branching and anastomosing longitudinal filaments; the *periphery* of dichotomous filaments laxly set in pellucid jelly, their apices moniliform, strongly united together. *Fructification* double, on distinct plants; 1, external *tubercles* containing, on a central placenta, dense clusters of spores (*favellidia*) held together by a network of fibres; 2, *tetraspores* scattered among the filaments of the periphery, or aggregated in dense, immersed sori. GIGARTINA (*Lam.*); —from *γυαπρον*, a *grape stone*, which the tubercles resemble.

GIGARTINA *pistillata*; frond compressed, stipitate, flabellately branched; branches repeatedly forked, with wide, rounded axils, naked, or pinnated with short, horizontal ramuli; apices acute; tubercles solitary or in pairs, on the ramuli; tetraspores chained together, in immersed sori, forming distortions in the branches.

GIGARTINA *pistillata*, *Lamour. Ess.* p. 49. *Grev. Alg. Brit.* p. 146. *Hook. Br. Fl.* vol. ii. p. 300. *Harv. Man.* p. 75. *Endl. 3rd Suppl.* p. 41. *Kütz. Phyc. Gen.* p. 402. t. 70. f. 1. *Mont. Fl. Algier.* p. 99.

SPHÆROCOCCUS *gigartinus*, *Ag. Sp. Alg.* vol. i. p. 274. *Ag. Syst.* p. 224.

FUCUS *pistillatus*, *Gmel. Fuc.* p. 159. t. 12. f. 1. *Lam. Diss.* p. 51. t. 27.

FUCUS *gigartinus*, *Linn. Syst. Nat.* vol. ii. p. 719. *Good. and Woodw. Linn. Trans.* vol. iii. p. 183. t. 17. f. 3, 4. *E. Bot.* t. 908. *With.* vol. iv. p. 111. *Turn. Syn.* vol. ii. p. 280. *Turn. Hist.* t. 28.

FUCUS *Cederi*, *Esper*, t. 135.

CERAMIIUM *gigartinum*, *Roth, Cat.* vol. iii. p. 109.

HAB. On rocks, near low-water mark. Perennial. Winter. Very rare. Coast of Cornwall, in several places. Discovered by the *Hon. Dr. Wenman* before 1800. St. Ives, *Stackhouse*. Penzance, *Brodie*. Padstow, *Miss Hill*. Rocks under St. Minver, at the mouth of the Padstow River, *Mrs. Griffiths*. Mount's Bay, *Dr. M'Culloch*. Whitsand Bay, *Dr. Jacob* (1829); *Mr. Gilbert Sanders* (1848), &c. Jersey, *Miss Turner*.

GEOGR. DISTR. Atlantic shores of France and Spain. Mediterranean sea.

DESCR. *Root* a broad, fleshy disc. *Fronde*s densely tufted, two to six inches high, compressed, rising with an undivided stem or stipe to the height of one or two inches, then branched in a fan-like manner; the branching normally dichotomous, and repeatedly forked, but from some of the internodes being very short, or altogether suppressed, various irregularities in branching occur. All the divisions are very patent, with wide, rounded axils; and the ultimate branches gradually taper upwards, and end in an



acute point. Barren specimens and those which produce tetraspores, have the forked branches usually naked ; in tubercle-bearing individuals, on the contrary, they are pinnated with short, horizontal, simple or forked ramuli, two to three lines long. *Tubercles* borne on the ramuli, either at their apices or more commonly below the point, which projects like a horn, solitary, or two or more together, usually very abundantly produced. *Tetraspores* contained in dark coloured swellings of the branches immersed in the substance ; each sorus of large size, thick, containing innumerable chained cruciate tetraspores. *Substance* cartilaginous, shrinking very much in drying. *Colour*, a dull purplish or brownish-red. It does not adhere to paper in drying, unless after long steeping in fresh water.

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For splendid specimens, fresh from the sea, of this very rare Alga, I am indebted to Mr. Gilbert Sanders of Plymouth, who was so fortunate, towards the close of last year, as to re-discover an old habitat where the plant had been sought for many years, and not found since 1829. From one of Mr. Sanders' newly gathered specimens our figure has been taken.

The characters of this species are so strongly marked, especially when in tubercular fruit, as is commonly the case, that it can scarcely be mistaken for anything else. In habit *G. mammillosa* comes nearest to it, but the channelled frond of that species affords a sufficient character. Barren specimens, or specimens with tetrasporic fruit, have rather the aspect of very narrow individuals of *Chondrus crispus*, but they seldom occur except in company with unmistakable forms.

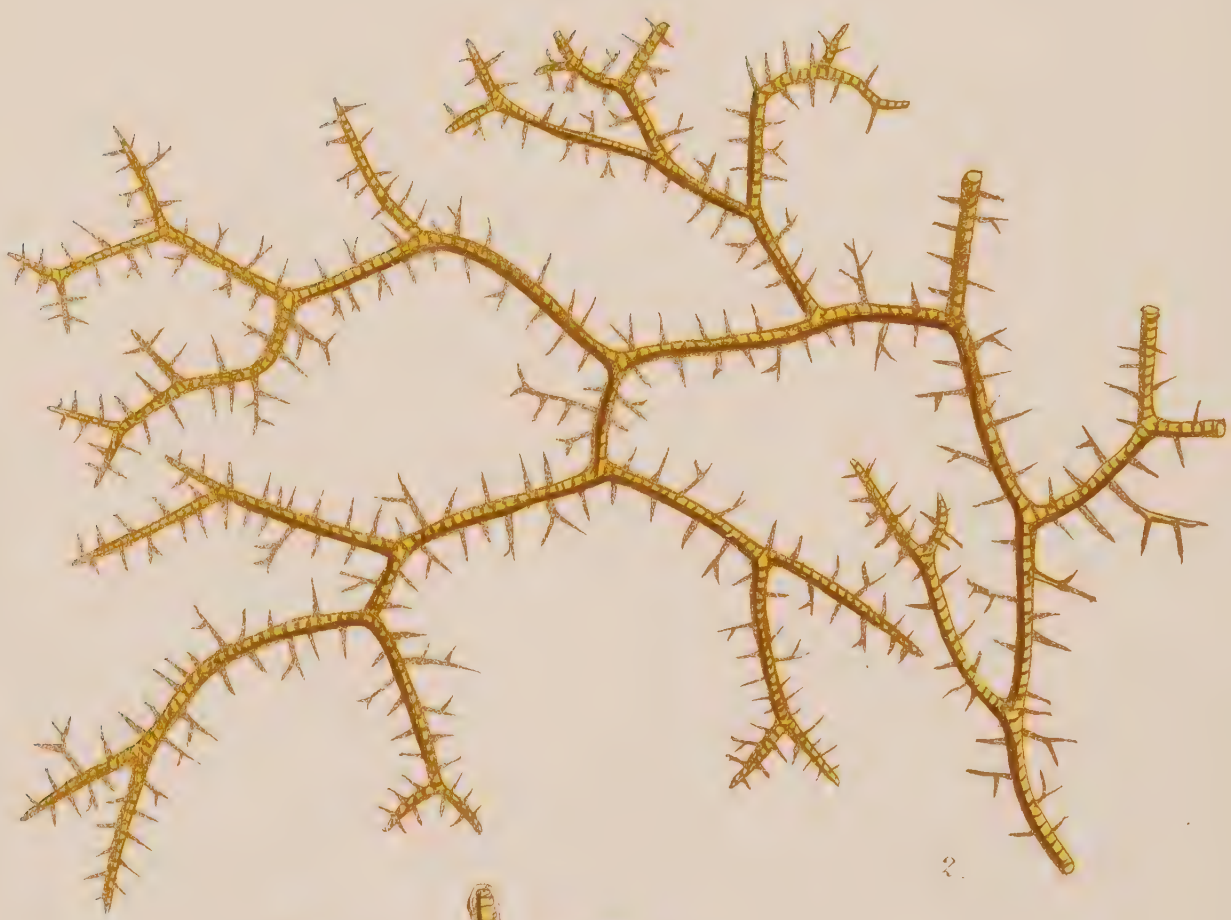
All the specimens received from Mr. Sanders bore tubercles. I have since been favoured by Dr. Cocks, with specimens well furnished with tetraspores. The latter are contained in very dense sori, something resembling nemathecia, sunk in the substance of the frond.

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Fig. 1. GIGARTINA PISTILLATA :—*of the natural size.* 2. Part of a branch with fertile ramuli. 3. Section of a tubercle. 4. Spores from the same. 5. Section of a sorus. 6. Tetraspores from the same. 7. Transverse semi-section of a small portion of the frond :—*all more or less highly magnified.*

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## PLATE CCXXXIII.

ECTOCARPUS LANDSBURGII, *Harv. (n. sp.)*

GEN. CHAR. *Frond* capillary, jointed, olive or brown, flaccid, single-tubed. *Fruit* either spherical, elliptical, or lanceolate *utricles* (or *spores*) borne on the ramuli, or imbedded in their substance. ECTOCARPUS (*Lyngb.*), —from *εκτος*, *external*, and *καρπος*, *fruit*.

ECTOCARPUS *Landsburgii*; filaments dark-brown, tenacious, intricate, much branched; branches irregularly forked, divaricated, zigzag, bristling with numerous short, spine-like, horizontal ramuli; articulations shorter than broad, the endochrome filling the cell, and recovering its shape on being moistened, after having been dried.

HAB. Dredged in deep water, in land-locked bays; rare. Annual. Summer. Lamlash, Isle of Arran, *Rev. D. Landsborough*. Roundstone Bay, Galway, *W. H. H.*

GEOGR. DISTR. Shores of Scotland and Ireland.

DESCR. *Filaments* capillary, one or two inches in length, densely entangled in small tufts, or rolled together in masses, irregularly much branched, of about the same diameter from the base to the apex. *Branches* spreading at very wide angles, dichotomous, or alternate, the lesser divisions very patent, horizontal, or recurved. *Ramuli* short, spine-like, horizontal, simple, or forked, not half a line in length, now thinly, now thickly scattered over the branches, rarely opposite. *Articulations* shorter than broad, filled by a coloured bag; the dissepiments and border very narrow. *Substance* tenacious, membranous, not closely adhering to paper, and not affected by long steeping in fresh water. *Colour*, a dark brown.

The first specimens which I received of this curious little plant were dredged by my friend the Rev. D. Landsborough in Lamlash Harbour, a circumstance which I record in the specific name; pleased with the opportunity thus afforded me of connecting Mr. Landsborough's name with the botany of an island whose history and natural beauties it has been to him a labour of love to illustrate by his pen.\*

The ramification of our *E. Landsburgii* so nearly agrees with that of *E. distortus*, Carm., that I felt disposed, at first, to regard it as that species. But a careful comparison of both

\* ARRAN, a poem in six cantos; and Excursions to Arran, with reference to the natural history of the island. By the Rev. D. Landsborough:—Edinburgh, 1847.

plants, placed side by side on the table of the microscope, has convinced me of their perfect distinctness. In *E. distortus* the endochrome is small, leaving wide dissepiments and colourless borders ; the substance is exceedingly tender, and the branches break up into innumerable frustules when re-moistened. In fact, it is impossible to trace the ramification from the extreme *rotteness* of the moistened frond. In *E. Landsburgii* on the contrary, the endochrome completely fills the cavity ; the dissepiments are mere lines ; and the substance is exceedingly tough, and may be kept in fresh water for hours or days, without injury. These characters appear to me sufficient. We must also bear in mind that *E. distortus* is a littoral species, while our new species has only been found by dredging in deep water. It appears to be of rare occurrence. Mr. Landsborough found only a few small tufts ; nor was I much more fortunate in collecting it at Roundstone. It is satisfactory to know, however, as establishing the character of the species, that the specimens from the west of Ireland agree in all respects with those from Scotland.

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Fig. 1. ECTOCARPUS LANDSBURGII:—*of the natural size.* 2. A branching portion. 3. Part of the same. 4. Transverse section of the stem:—*all more or less highly magnified.*

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## PLATE CCXXXIV.

JANIA CORNICULATA, *Lamour*.

GEN. CHAR. *Frond* filiform, articulated, dichotomously branched, coated with a calcareous deposit. *Fructification* urn-shaped *ceramidia*, formed of the axillary articulation of the uppermost branches (mostly two horned), pierced at the apex by a minute pore, and containing a tuft of erect, pyriform, transversely parted *tetraspores*. JANIA (*Lamour*.),—I suppose from *Janira*, one of the *Nereides*.

JANIA *corniculata*; articulations of the principal divisions obconical, compressed, their upper angles sharp and prominent; those of the uppermost ramuli cylindrical, filiform.

JANIA *corniculata*, *Lam. Cor. Flex.* p. 274. *Corall.* p. 123. *Gray, Nat. Ar. Br. Pl.* vol. i. p. 339. *Flem. Brit. Anim.* p. 514. *Johnst. Spong. and Lith.* p. 227. *Decne. Ess.* p. 111. *Endl. 3rd Suppl.* p. 49. *Kütz. Phyc. Gen.* p. 389.

CORALLINA *corniculata*, *Linn. Syst.* p. 806. *Pal. Elench.* p. 424. *Ellis and Soland. Zoop.* p. 121. *Turn. Br. Faun.* p. 212. *Lam. An. s. Vert.* 2nd Ed. vol. ii. p. 517.

HAB. Parasitical on the smaller Algæ, in rock pools between tide-marks, and in 4–5 fathoms water. Perennial? Summer. Southern shores of England and Ireland. Jersey, *Miss Turner*.

GEOGR. DISTR. Atlantic and Mediterranean shores of Europe.

DESCR. *Fronds* densely tufted, one or two inches high, repeatedly dichotomous, fastigate, the branches spreading, gradually attenuated towards the apex. In young specimens the branching is always regularly forked, but older specimens frequently show in their lower parts a disposition to become pinnated, from lateral opposite ramuli issuing from their joints. These ramuli, as well as the terminal forkings, are much narrower than other parts of the frond. *Articulations* of the principal branches twice or thrice as long as broad, tapering to the base, gradually enlarged upwards, compressed, their upper angles more or less produced, sometimes extending at each side into a long conical horn; articulations of the lesser branches and ramuli cylindrical. *Ceramidia* urn-shaped, in the upper axils. On maceration in acid, transverse striæ become visible in the articulations.

The genus *Jania*, if we confine it to the dichotomously branched species, may be allowed to stand as distinct from *Corallina*—at least in habit;—but it must be admitted that the two genera approach very nearly, if they do not rather merge one in the other. Had we only to consider European forms we might think differently. But the shores of warm countries, and espe-

cially of Australia, yield beautiful species, having the pinnated habit of *Corallina* with the *antennated* fruit (if so I may call it) of *Jania*. These form the section of *Jania*, called *Haliptilon* by Decaisne, and I have already figured, on *Corallina squamata*, fruit which, did it occur on an Australian specimen, would entitle the individual furnished with it to a place in the subgenus *Haliptilon*.

*Jania corniculata* differs from the more common *J. rubens* chiefly, if not altogether, in the form of the lower articulations; much as *Corallina squamata* differs from *C. officinalis*. The species has been generally kept up by all authors, since the time of Ellis, who first distinguished it. On the British shores it is most common on the southern coast, while *J. rubens* is found all round the island.

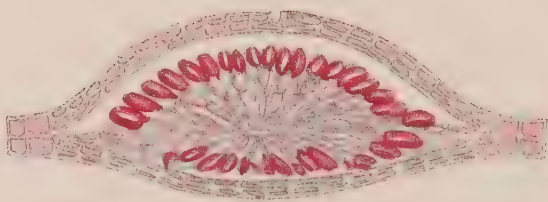
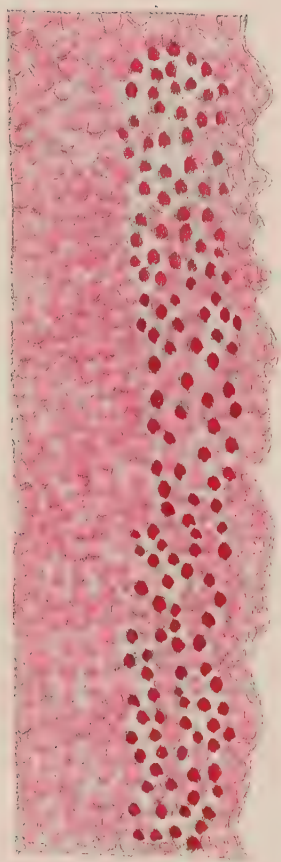
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Fig. 1. JANIA CORNICULATA :—*of the natural size*. 2. Portion of the branching stem. 3. Portion of another stem, becoming pinnated. 4. Ceramidium and ramuli. 5. Articulation of the stem after maceration in acid :—*all more or less magnified*.

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PLATE CCXXXV.

NITOPHYLLUM GMELINI, *Grev.*

GEN. CHAR. *Frond* membranaceous, reticulated, rose-red (rarely purplish), irregularly cleft, veinless, or furnished with irregular veins towards the base. *Fructification* two-fold, on distinct plants; 1, convex *tubercles* (*coccidia*) immersed in the frond, and containing a mass of spores; 2, *tetraspores*, grouped into definite *sori* or spots, variously scattered over the frond. NITOPHYLLUM (*Grev.*),—corruptly formed from *nitor*, to *shine*, and *φυλλον*, a *leaf*.

NITOPHYLLUM *Gmelini*; frond short-stalked, fan-shaped, with a roundish outline, variously cleft into broadly wedge-shaped segments, waved, curled, rather rigid, marked near the base (and sometimes over the surface) with vague, vanishing nerves; spots of tetraspores linear, confined to the margin.

NITOPHYLLUM *Gmelini*, *Grev. Alg. Brit.* p. 82. *Hook. Fl. Brit.* vol. ii. p. 288. *E. Bot. Suppl.* t. 2779. *Wyatt, Alg. Danm.* no. 65. *Harv. in Mack. Fl. Hib.* part 3. p. 193. *Harv. Man.* p. 58.

AGLAIOPHYLLUM *Gmelini*, *Mont. Endl. 3rd Suppl.* p. 52. *Kütz. Phyc. Gen.* p. 443. *Endl. 3rd Suppl.* p. 52.

DELESSERIA *Gmelini*, *Lamour. Ess.* p. 36.

HAB. On rocks, and the larger Algæ, near low-water mark, and at a greater depth. Annual. Summer. South of England; particularly large and abundant near Plymouth. North and west of Ireland. Howth, *Miss Gower*. Jersey, *Miss White and Miss Turner*.

GEOGR. DISTR. Atlantic coasts of France and Spain.

DESCR. *Root* a small, conical disc. *Stem* from a quarter to half an inch in length, cylindrical and cartilaginous below, soon becoming compressed, and then expanding into the wedge-shaped base of the frond. *Frond* two to six inches in length, and as much or more in breadth, flabelliform, with a roundish outline, either nearly entire, with the margin cut into shallow lobes, or deeply cleft into numerous broad segments, which are either jagged or subdivided in a dichotomous manner; and sometimes cut into narrow ribbons. *Segments* cuneate at base, widening upwards, their apices rounded, or angularly cut. The *margin* is generally much undulated. From the base of the frond there issue numerous branching veins, which ramify over the surface, and gradually become fainter upwards; these in some specimens are faint, and soon lost, and in others are strongly marked and evident, even in the upper segments. *Tubercles* either confined to the margin, or scattered over the disc of the upper lobes, hemispherical, depressed, containing a large tuft of dark-red spores. *Tetraspores* disposed in linear *sori*, always placed just within the margin of the frond, and following its curvature. *Colour* a full deep-lake, becoming a bright pink in drying. *Substance* crisp, and somewhat rigid, crackling in the fingers; becoming flaccid in fresh-water. *Cells* of the surface large, irregularly hexagonal.



From all the British species of *Nitophyllum*, except *N. laceratum*, this handsome plant may be at once distinguished, when in tetrasporic-fruit, by the marginal position of the sori; from *N. laceratum* it can only be known by difference in form, in substance, and, in some measure, by its brighter colour. The usual narrow varieties of *N. laceratum* are so different from any state of *N. Gmelini*, that we should hardly anticipate the occurrence of individuals of doubtful characters, which seem to stand almost equidistant from either species. And yet some luxuriant specimens of *N. laceratum* so nearly approach the cloven varieties of *N. Gmelini*, that in a dried state especially, they are apt to deceive even a practised eye. When the plants are freshly gathered indeed, they are most easily separated,—*N. Gmelini* being known by a peculiarly crisp, rigid feel, and *N. laceratum* by softness, and at the same time toughness. The colour of the latter is more purple, and often reflects prismatic colours; and the nerves are much more clearly defined than in *N. Gmelini*.

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Fig. 1. *NITOPHYLLUM GMELINI*:—*of the natural size*. 2. Portion of the frond, with a marginal *sorus*. 3. *Tetraspores*, from the same. 4. Portion of the frond with tubercles. 5. Section of one of the tubercles:—*all more or less highly magnified*.

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## PLATE CCXXXVI.

CLADOPHORA REPENS, *J. Ag.*

GEN. CHAR. *Filaments* green, jointed, uniform, branched. *Fruit* aggregated granules or zoospores, contained in the joints, having, at some period, a proper, ciliary motion. CLADOPHORA (*Kütz.*), — from κλαδος, a *branch*, and φέρω, to *bear*.

CLADOPHORA *repens*; forming dense, cushion-shaped or globular tufts; filaments short, capillary, rigid, densely matted together, rising from root-like fibres; slightly branched; branches erect, subsimple, or forked, naked, or with a few distant, second ramuli; articulations cylindrical, very long (ten to twenty times as long as their diameter).

CONFERVA *repens*, *J. Ag. Alg. Medit.* p. 13.

CEGAGROPILA *simplex*, *Lenorm. in Herb. T. C. D.* (!)

HAB. Thrown on shore after a gale. Annual? Summer. Jersey, *Miss Turner*.

GEOGR. DISTR. Shores of the Mediterranean Sea. Atlantic coast of France, *Lenormand*!

DESCR. *Tufts* very dense, an inch or two in breadth, and about half an inch in thickness, globose or oblong, cushion-like, composed of innumerable, capillary filaments, closely matted together. The filaments are at first decumbent, connected by root-like fibres, which form the substratum of the tufts; from the decumbent filaments issue, at the joints, erect branches, half an inch in length, simple, or once forked, and either naked or furnished with a few simple, distant, second ramuli. Each branch consists of about four or five, rarely more, articulations; and each ramulus usually of one, rarely of two articulations. The articulations are therefore of great length, as compared with their diameter; in our specimen the length is frequently as much as twenty times the breadth:—they are cylindrical, and the diameter at the tip of the branches is as great as at the base. The *colour* appears to have been a dark green; it is dingy and somewhat olive-green in the dried state. The substance is rigid, and the plant does not adhere to paper when dry.

In a recent number I had the pleasure of figuring a new species of *Dasya* from the shores of Jersey, and I have now to introduce, from the same locality, a *Cladophora*, discovered by my valued correspondent, Miss Turner, to whom I am indebted for many Jersey Algæ. Miss Turner informs me that the specimens were picked up on the beach after a heavy gale, in 1846; four only were found, and the plant has not since been noticed.

From one of these specimens, now in Herb. T. C. D., our figure has been taken.

Of the reference to M. Lenormand's *Ægagropila simplex* (seemingly a manuscript name) I am quite certain, a specimen communicated to me by that gentleman agreeing in all respects with Miss Turner's plant; but possibly the reference to the Mediterranean *Conf. simplex*, J. Ag., may be incorrect. And yet I have little hesitation in uniting our plant with that species. They agree in every respect except in the length of the articulations, which, in the Mediterranean plant, are shorter than in ours; and this slight discrepancy seems scarcely sufficient to separate plants so closely allied, by so many remarkable features.

Though not one of the handsomest, this is one of the most curious species of the genus. Outwardly it nearly resembles *C. Brownii*, but the form and proportion of the articulations are very different.

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Fig. 1. CLADOPHORA REPENS; tuft:—*of the natural size*. 2. Portions of three filaments from the same. 3. An articulation from one of the filaments:—*magnified*.

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## PLATE CCXXXVII.

STILOPHORA LYNGBYÆI, *J. Ag.*

GEN. CHAR. *Root* a small, naked disc. *Frond* filiform, solid or tubular, branched. *Fructification*, convex, wart-like sori scattered over the surface, composed of obovate spores nestling among moniliform, vertical filaments. STILOPHORA (*J. Ag.*)—from *στιλη*, a *point* or *dot*, and *φορεω*, to *bear*; in allusion to the dot-like fructification.

STILOPHORA *Lyngbyæi*; frond tubular, at length distended, much branched, the branches dichotomous, spreading, with wide, rounded axils, much attenuated toward the apices; ramuli scattered, forked, capillary; sori subdistant, disposed in transverse lines.

STILOPHORA *Lyngbyæi*, *J. Ag. Symb.* vol. i. p. 6. *Sp. Alg.* vol. i. p. 84. *Endl.* 3rd *Suppl.* p. 26.

SCYTOSIPHON *paradoxus*, *Fl. Ddn.* t. 1595. f. 2.

SPERMATOCHNUS *paradoxus*, *Kütz. Phyc. Gen.* p. 335.

CHORDARIA *paradoxa*, *Lyngb. Hyd. Dan.* p. 53. t. 14.

STRIARIA *Grevilleana*, *Pollexf. MS.*

SPOROCHNUS *rhizodes*  $\beta$  *paradoxa*, *Ag. Sp. Alg.* vol. i. p. 157. *Grev. Alg. Brit.* p. 43. *Hook. Br. Fl.* vol. ii. p. 275. *Harv. Man.* p. 27.

HAB. In land-locked bays, and estuaries, on a muddy and sandy bottom, in 4–10 fathom water. Annual. Summer. Several places on the shores of Scotland and Ireland, abundantly.

GEOGR. DISTR. Baltic Sea. Atlantic Coasts of Europe. Mediterranean Sea.

DESCR. *Root*, a small disc. *Fronds* from two to four or six feet in length, from one to two lines in diameter at their widest part, but tapering to a capillary fineness towards the apices, usually tufted, and sometimes covering the ground in continuous patches that spread over several square yards. *Stem* very much branched in a dichotomous manner, becoming irregular by the occasional suppression of one of the arms of the fork; the divisions widely spreading, with very broad, rounded axils; the forks distant below, gradually nearer towards the apex. The lower part of the stem becomes, in age, much distended, with a wide cavity and thin walls, the whole of the central cellular substance dying out; in younger parts it is more solid. *Warts* of fructification more distant than in *S. rhizodes*, and placed in transverse, slightly spiral bands, containing obovate spores attached to club-shaped paranemata. *Colour* a pale, testaceous brown, olive toward the tips, and becoming greener in drying, especially after the specimen has been steeped in fresh water. *Substance* when recent crisp, and very brittle; soon becoming flaccid and somewhat tough, giving out mucus. It closely adheres to paper.



Hitherto this plant has appeared in British works as a variety of *S. rhizodes*, figured at Plate LXX, and notwithstanding its different appearance, when *typical* specimens of each are under examination, it is not without hesitation that I admit the present to be specifically distinct. Those who are acquainted with the difference in aspect assumed by marine plants, according to the depth of water at which they grow, will best understand my doubts; remembering that the typical *S. rhizodes* grows within tide-marks, and *S. Lyngbyæi* at a considerable depth, beyond the reach of the tide. And the differences between the two are precisely of the nature of those caused by deep water. If we regard *size*, we must remember that *Asperococcus Turneri* in tide pools is seldom more than six inches long; and that when growing with our *S. Lyngbyæi*, which it frequently accompanies, it has fronds three or four feet in length and proportionably broad. So also *Gracilaria confervoides*, which grows to six or seven feet in length in deep water. The *distention* of the frond in *Stilophora* and the attenuation of the branches likewise increase with depth. On the whole, therefore, the characters typical of our *S. Lyngbyæi* become more strongly marked as the depth of water increases, and appear to me greatly to depend on locality. It is for this reason that I am inclined to question its right to be considered a species, distinct from *S. rhizodes*.

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Fig. 1. STILOPHORA LYNGBYÆI;—part of a frond, *the natural size*. 2. Segment of a branch. 3. Cross section of the same. 4. Section of a wart. 5. Spore and paranemata, from the same;—*all magnified*.

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## PLATE CCXXXVIII.

RHIZOCLONIUM\* RIPARIUM, *Kütz.*

GEN. CHAR. *Filaments* green, jointed, uniform, decumbent, simple or spuriously branched; branches short and root-like. *Fruit*, granules contained in the cells. RHIZOCLONIUM (*Kütz.*),—from ῥίζω, to root, and κλῶν, a branch.

RHIZOCLONIUM *riparium*; filaments long, slender, decumbent, pale-green, forming wide strata, flaccid, entangled, angularly bent, furnished at the angles with short, root-like processes (which sometimes, but rarely, lengthen into very patent branches, and often attach themselves to neighbouring filaments.)

RHIZOCLONIUM *obtusangulum*, *Kütz. Phyc. Gen.* p. 261. (and probably *R. Jurgensii* and *R. littoreum*, *ib.*)

CONFERVA *riparia*, *Roth Cat. Bot.* vol. iii. p. 216. *Eng. Bot.* t. 2100. *Dillw. Conf.* p. 111. *Sup. t. E. Ag. Syst.* p. 106. *Harv. in Hook. Br. Fl.* vol. ii. p. 359. *Harv. in Mack. Fl. Hib.* part 3. p. 230. *Harv. Man.* p. 140.

CONFERVA *obtusangula*, *Lyngb. Hyd. Dan.* p. 159. t. 55.

CONFERVA *perreptans*, *Carm. Harv. in Hook. Br. Fl.* vol. ii. p. 352.

CONFERVA *tortuosa*, *Wyatt, Alg. Danm.* no. 190. (not of *Dillw.*)

ZYGNEMA *littoreum*, *Lyngb. Hyd. Dan.* t. 59. (?)

HAB. On sand-covered rocks, near high-water mark. Annual. Summer. Not common. Bantry Bay, *Miss Hutchins.* Sunderland, *Mr. W. Backhouse.* Yarmouth, *Mr. Dillwyn.* Torquay, &c., *Mrs. Griffiths.* Appin, *Capt. Carmichael.*

GEOGR. DISTR. Shores of Northern Europe.

DESCR. *Filaments* prostrate, forming pale green strata, sometimes spreading in patches some square feet in area, slender, lying close together, and frequently matted inextricably. The threads are angularly bent, at intervals, and from each angle issues a short, root-like tapering ramulus, usually consisting of two or three cells, standing at right, or very obtuse angles with the main filament. This rarely lengthens into a proper branch: more generally it preserves the root-like character, and attaches itself to a neighbouring filament, and sometimes two such rootlets uniting together, bind the filaments still more closely together. I have not observed the roots inosculating with the attached filament, as the connecting tubes of *Zygnema* do. *Articulations* about twice as long as broad, full of a pale-green endochrome. *Substance* flaccid, not very closely adhering to paper.

This curious little plant was first noticed as British by the

\* Misprinted *Rhizogonium* in the systematic index to the 1st volume.



late Miss Hutchins of Bantry, but notwithstanding the figures given by Dillwyn, and in English Botany, and its very distinct characters, it has been much misunderstood. The specimens published by Mrs. Wyatt, under the name *Conferva tortuosa*, belong, in the copies of her valuable work which I have examined and, I suspect, in all the others, to our *R. riparium*. It is a more slender plant than *C. tortuosa*, of a paler colour, and, above all, distinguished by the root-like fibres which issue at intervals, from the articulations; and the presence of which has induced Kützinger to place it in a separate genus.

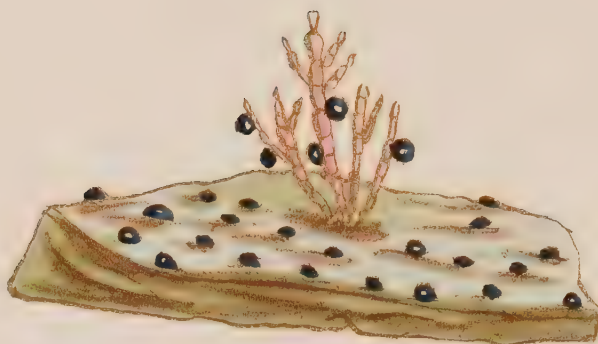
I am not certain whether all the synonyms quoted above belong to this, or to several closely allied species. According to Prof. Kützinger there are three or four distinct plants confounded under the *Conferva riparia* of authors, a point to determine which I have not sufficient data at hand. As regards the specimen now figured, it is at least certain that ours is the plant of Dillwyn, our figure having been prepared from one of the original specimens collected by Miss Hutchins.

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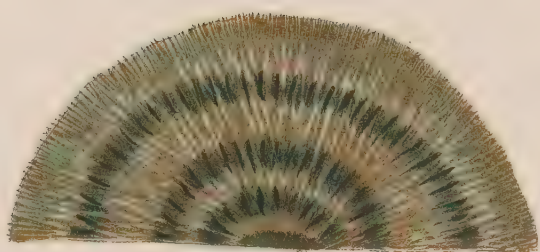
Fig. 1. RHIZOCLONIUM RIPARIUM; stratum,—*of the natural size*. 2. Filaments from the same; *magnified*. 3. A portion:—*more highly magnified*.

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1.



2.



3.



4.



## PLATE CCXXXIX.

RIVULARIA ATRA, *Roth*.

GEN. CHAR. *Fronde* globose or lobed, fleshy, firm, composed of continuous radiating filaments, annulated within, each springing from a spherical globule. *RIVULARIA* (*Roth*),—so named by Roth, in allusion to the fluviatile habit of some of the first-discovered species.

*RIVULARIA atra*; fronds minute, scattered, globose, or hemispherical, firm, smooth, glossy black-green; filaments dark green, densely packed.

*RIVULARIA atra*, *Roth*, *Cat. Bot.* vol. iii. p. 340. *Ag. Syn.* p. 130. *Ag. Syst.* p. 24. *E. Bot.* t. 1798. *Harv. in Hook. Br. Fl.* vol. ii. p. 392. *Harv. in Mack. Fl. Hib.* part 3. p. 235. *Harv. Man.* p. 152.

*EUACTIS atra*, *Kütz. Phyc. Gen.* p. 241.

*LINCKIA atra*, *Lyngb. Hyd. Dan.* p. 195. t. 65.

*LINCKIA hemispherica*, *Schum. Enum.* vol. ii. p. 114.

*TREMELLA hemispherica*, *Linn. Syst. Nat.* vol. ii. p. 714. *Huds. Fl. Ang.* p. 565. *Lightf.* p. 900. *With.* vol. iv. p. 81.

*CHÆTOPHORA atra*, *Ag. Disp.* p. 43.

HAB. On rocks and stones, and on Corallines and other Algæ, between tide marks. Perennial? At all seasons. Very abundant.

GEOGR. DISTR. Shores of Europe.

DESCR. *Fronde*s one or two lines in diameter, hemispherical when attached to flat surfaces, globose when growing on filiform Algæ, very hard, of an exceedingly firm, compact substance, and dark colour. *Filaments* subulate, attenuated, connected together in branching, subdichotomous series, filled with dark-green endochrome, which is annularly divided in the upper part, and coheres in oblong masses in the lower. Each filament springs from a transparent globule (or connecting cell).



A very common plant on all rocky shores, growing either on the rocks, or on the smaller Algæ, especially on *Cladophora rupestris* and *Corallina officinalis*. It forms small, hard wart-like balls or hemispheres, rarely as large as the seed of Sweet-Pea (*Lathyrus odoratus*), and sometimes completely covers the plant to which it attaches itself.

Carmichael describes an allied species, *R. applanata*, said to differ from *R. atra* in being flatter and thinner in substance, and growing in similar localities. This I have never seen.

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Fig. 1. RIVULARIA ATRA :—*of the natural size.* 2. Vertical section of a frond.  
3. Some of the filaments :—*magnified.* 4. A filament separated and *highly magnified.*

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## PLATE CCXL.

ELACHISTEA FUCICOLA, *Fries*.

GEN. CHAR. *Fron*d parasitical, consisting of a dense tuft of free, simple, articulated, olivaceous filaments, rising from a common tubercular base, composed of vertical branching fibres closely combined into a cartilaginous mass. *Fructification*, pear-shaped spores attached to the base of the filaments, concealed in the tubercle, and frequently accompanied by paranemata. ELACHISTEA (*Fries*), from ελαχιστα, the *least*; from the small size of these plants.

ELACHISTEA *fucicola*; tufts pencilled; filaments elongate, flaccid, membranaceous, attenuated upwards; articulations once or twice as long as broad; tubercular mass spherical.

ELACHISTEA *fucicola*, *Fries*. *Fl. Scan.* p. 317. *Aresch. Pug.* t. viii. f. 6-7. *J. Ag. Sp. Alg.* vol. i. p. 12.

MYRIONEMA *fucicolum*, *Endl.* 3rd. *Suppl.* p. 23.

PHYCOPHILA *fucorum*, and *P. Agardhii*, *Kütz. Phyc. Gen.* p. 330.

CONVERVA *fucicola*, *Velley*, *Pl. mar.* No. 4. *Dillw. Conf.* t. 66. *Lyngb. Hyd. Dan.* t. 50. *Ag. Syst.* p. 103. *Harv. in Hook. Br. Fl.* vol. ii. p. 354. *Harv. in Mack. Fl. Hib.* part. 3. p. 227. *Harv. Man.* p. 131. *Wyatt, Alg. Danm.* no. 192.

CONFERVA *ferruginea*, *Ag. Syst.* p. 103.

HAB. Parasitical on *Fucus serratus* and *F. vesiculosus*. Annual. Summer and Autumn. Common.

GEOGR. DISTR. Atlantic shores of Northern Europe. Baltic Sea.

DESCR. *Filaments* forming brush-like tufts, an inch in length, rising from a hemispherical, cartilaginous tubercle, which gradually increases in size as the plant advances in growth. This tubercle is composed of numerous dichotomous, articulated, vertical filaments, issuing from a common point, beneath the surface of the *Fucus* on which the parasite grows, and radiating in all directions. After several forkings the tips of the branches terminate in a cluster of linear club-shaped fibres or paranemata, three or four of which spring from each apex, and among these, which constitute the *periphery* of the tubercle, are attached both the *spores*, and the long *filaments* which form the brush-like tuft. *Filaments* an inch long, scarcely tapered at the base, much attenuated to the apex; the articulations once and a half to twice as long as broad. *Spores* at first club-shaped, then pyriform, and at length ellipsoidal. *Colour* olive-green, becoming brown or foxy.

This is the largest species, the longest known, and the com-



monest of the genus *Elachistea*. It infests *Fucus vesiculosus* and *F. serratus* almost wherever these plants grow, and may be found nearly at every season. At its first appearance it forms a minute pencil of greenish filaments rising from a scarcely perceptible tubercle. As it grows larger, the colour changes to brown, and the tubercle increases much in size, and at length becomes a button, attached by a central point. It then falls away and the plant perishes. The growth of other *Elachistea* is very similar.

By J. Agardh this genus is placed in *Ectocarpeæ*, but, in my opinion, incorrectly. The structure of the tubercle, in which the spores are lodged, is precisely that of the *Chordarieæ*, and did this tubercle constitute the whole plant, no doubt Professor Agardh would associate the genus with the latter family, for the whole structure of this part is analogous to that of *Leathesia*, and the nature and position of the *spores* the same. But then there are the long pencilled filaments composing the largest part of the frond; and these are very unlike anything found elsewhere in *Chordarieæ*, while they closely resemble the threads of an *Ectocarpus* in structure. Taking these filaments for *the frond*, Agardh would be correct in referring the genus to *Ectocarpeæ*. But, to my mind, the *tubercle*, as it contains the fructification, must be regarded as the most essential part of the structure; the *filaments* as an accessory part; and therefore I am of opinion that the genus is best placed in *Chordarieæ*.

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Fig. 1. Tufts of ELACHISTEA FUCICOLA, growing on *Fucus vesiculosus*;—*the natural size*. 2. Part of a branching filament of the tubercle, with its paranemata, and excurrent filaments, one of which is bent back, the others cut off. 3. Portions of one of the excurrent filaments. 4. Paranemata and spore. 5. Spores in various stages of advancement;—*all magnified*.

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1.

2.

3.





## PLATE CCXLI.

LAMINARIA BULBOSA, *Lamour.*

GEN. CHAR. *Frond* stipitate, coriaceous or membranaceous, flat, undivided or irregularly cleft, ribless. *Fructification*; cloudy spots of spores, imbedded in the thickened surface of some part of the frond. LAMINARIA (*Lamour.*),—from *lamina*, a thin plate, in allusion to the flat frond.

LAMINARIA *bulbosa*; stem flat, with a waved margin, once twisted at the base, rising from a roundish, hollow, warted tuber; frond oblong, deeply cleft into many linear segments.

LAMINARIA *bulbosa*, *Lamour. Ess.* p. 22. *Ag. Syn.* p. 18. *Lyngb. Hyd. Dan.* p. 21. *Hook. Fl. Scot.* part 2. p. 99. *Ag. Syst.* p. 271. *Ag. Sp. Alg.* vol. i. p. 114. *Grev. Alg. Brit.* p. 29. *Hook. Br. Fl.* vol. ii. p. 271. *Harv. in Mack. Fl. Hib.* part 3. p. 171. *Harv. Man.* p. 24. *Wyatt, Alg. Danm.* no. 4.

LAMINARIA *Belvisii*, *Ag. Sp. Alg.* vol. i. p. 115. *Ag. Syst.* p. 271.

SACCORHIZA *bulbosa*, *De la Pyl. Fl. Ter. New.* p. 23. *J. Ag. Sp. Alg.* vol. i. p. 137.

HALIGENIA *bulbosa*, *Dne. Ess.* p. 50. *Endl. 3rd. Suppl.* p. 27.

PHYCOCASTANUM *bulbosum*, *Kütz. Phyc. Gen.* p. 346.

FUCUS *bulbosus*, *Huds. Fl. Angl.* p. 579. *Linn. Trans.* vol. iii. p. 153. *Turn. Syn.* p. 212. *Esper, Ic.* t. 123. *E. Bot.* t. 1760. *Turn. Hist.* t. 161.

FUCUS *polyschides*, *Lightf. Fl. Scot.* p. 936. *With.* vol. iv. p. 97. *Stack. Ner. Brit.* t. 4.

FUCUS *palmatus*, *Gmel.* t. 30.

ULVA *bulbosa*, *DC. Fl. Fr.* vol. ii. p. 16.

HAB. On rocks at low-water mark, and to the depth of 10–15 fathoms. Perennial. Autumn. Abundant on the British shores.

GEOGR. DISTR. Shores of Europe from Norway to Spain. Ferroe Islands. Coast of Guinea, *Pal. de Beauvois*.

DESCR. *Root*, in the young state of the plant, composed of several clasping fibres, gradually perishing as the frond increases in size, and its place supplied by a hollow tuber which originates at a higher point on the stem. *Stem* at first slender and filiform, half a line in diameter and an inch in height, with a small dilatation like a collar a little above its middle; gradually becoming broader and quite flat, till, in large specimens, it is four or five feet long, and two or three inches wide, with the margin very much waved and curled. In these full-grown specimens, the collar-like swelling becomes dilated into a hollow tuber, from four inches to a foot in diameter, rough with wart-like or cylindrical fibrous projections. The portion of the stem below the tuber is either absorbed or perishes, and roots issue from the lower surface of the tuber to supply the place of the original holdfast: thus a new base is provided for the frond. *Frond* in young specimens membranaceous, oblong, or ovate, undivided; when full-grown coriaceous,

thick, from three to six feet in length, oblong, cloven into innumerable narrow, ribbon-like segments. *Spores* abundantly formed in the wavy margin of the stem, but not confined to this portion of the frond. They originate in the cells immediately beneath the surface, and are closely packed together, vertically, in large cloud-like sori; they are at first linear-clavate, at length elliptical; their perispore drawn out at base into a slender stipe. *Colour* a clear, brown olive; greenish when young. *Substance* more tender than in *L. digitata*.

This is the largest British species of the *Laminariæ*, its frond in some instances forming, when spread out on the ground, a circle twelve feet in diameter. Its common name is *Furbelows*, and its aspect must be familiar to most visitors of the sea-shore.

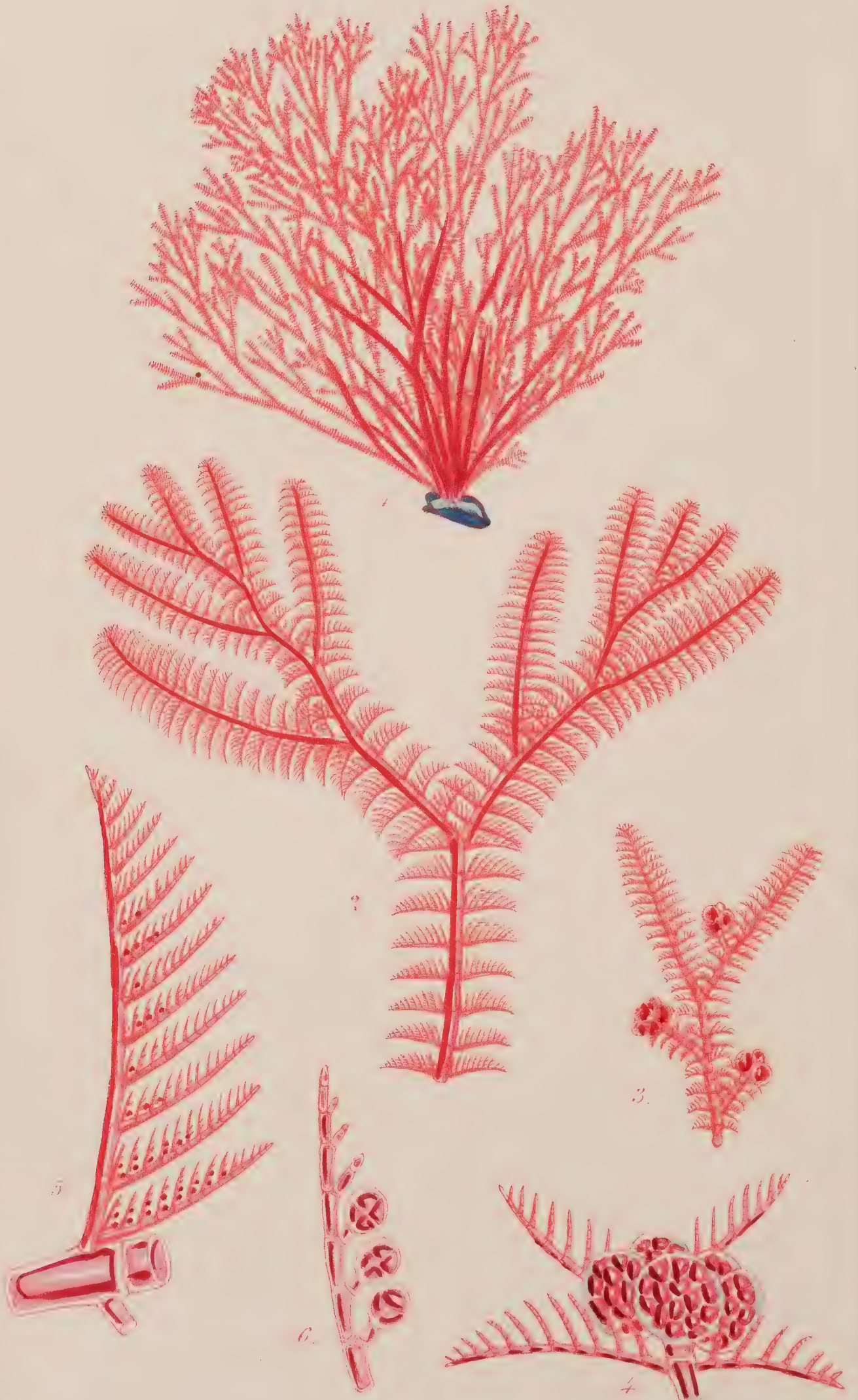
In modern systems it is generally separated from *Laminaria*, and no less than three generic names have recently been proposed for it, of which *Saccorhiza*, having the priority in publication, has been adopted by Prof. J. Agardh in his recent work. *L. bulbosa* differs somewhat, in habit, from other *Laminariæ*, and may perhaps be allowed to form a separate generic group; but the chief diagnostic character insisted on by the upholders of the change is not valid. It is asserted that the spores are confined to the frill of the stem. It is quite true that here they are most abundant; but they also occur in effused patches on the lamina, as in other *Laminariæ*.

I am indebted to my friend John Nuttall, Esq., of Titoor, for the specimen here figured, which is singularly characteristic of the full-grown plant, and yet of so small a size as to come easily into a quarto plate.

Fig. 1. LAMINARIA BULBOSA; a small, but fully formed specimen:—of the natural size. 2. Section, with spores, *in situ*:—magnified. 3. Spores, of various ages:—highly magnified.









## PLATE CCXLII.

CALLITHAMNION PLUMULA, *Lyngb.*

GEN. CHAR. *Frond* rosy or brownish red, filamentous, stem either opake and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds, on distinct plants; 1, external *tetraspores*, scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like *receptacles* (*favellæ*) seated on the main branches, and containing numerous, angular spores. CALLITHAMNION (*Lyngb.*),—from *καλος*, *beautiful*, and *θαμνιον*, a *little shrub*.

CALLITHAMNION *Plumula*; stems distichously branched, subdichotomous, articulated; each articulation bearing a pair of short, recurved plumules, pectinated on their upper margin.

CALLITHAMNION *Plumula*, *Lyngb. Hyd. Dan.* p. 127. *Ag. Sp. Alg.* vol. ii. p. 159. *Harv. in Hook. Br. Fl.* vol. ii. p. 339. *Harv. in Mack. Fl. Hib.* part 3, p. 213. *Harv. Man.* p. 104. *Wyatt, Alg. Danm.* no. 138. *Endl. 3rd Suppl.* p. 34. *Hook. fil. Fl. Antarct.* vol. ii. p. 489. *J. Ag. Alg. Medit.* p. 71. *Kütz, Phyc. Gen.* p. 372.

CERAMIUM *Plumula*, *Ag. Syn.* p. 62. *Ag. Syst.* p. 142.

CONFERVA *Plumula*, *Ellis, Phil. Trans.* p. 57. t. 18. *Dillw.* t. 50.

CONFERVA *Turneri*, *Sm. E. Bot.* t. 1637 (not 2339).

HAB. On rocks and Algæ, near low-water mark, and in 4–15 fathoms water. Annual. Summer. Not uncommon, from Orkney to Cornwall.

GEOGR. DISTR. Atlantic shores of Europe and North America. Mediterranean Sea. Cape Horn, *Dr. Hooker*. Tasmania, *Gunn*.

DESCR. *Root*, a small disc. *Fronds* densely tufted, from two to six inches in length, capillary, flaccid, distichously branched, the branches alternate or subdichotomous, repeatedly divided. The stems are articulated to the base, and every articulation, of the main stems as well as of the branches and their divisions, bears a pair of opposite, minute ramuli or *plumules*, inserted a short way below the apex of the articulation, and very much more slender than the part from which they spring. In luxuriant specimens *four* plumules instead of two, are frequently found. These plumules are from half a line to a line in length, spreading horizontally or somewhat reflexed, and pectinated, or bi-tripectinated along their upper faces; the ramuli of the combs standing at an angle of 45° with the rachis. Every articulation of the rachis bears its ramulus, with great regularity. The *tetraspores* are borne on the tips of the ultimate ramuli; they are therefore pedicellate. The *favellæ* are densely clustered, and terminate the main branches, which are there always shortened. The *colour* is a fine carmine, sometimes brownish; and is well preserved in drying. The substance is soft and tender, and the plant closely adheres to paper.



A very charming plant, though a common one ; common, not merely on the shores of Europe, but dispersed far and wide through the ocean, north and south of the Line. Dr. Hooker gathered it at Cape Horn, and Mr. Gunn has sent it from Van Dieman's Land. I have examined specimens from these distant habitats, and compared them with those from our own shore, and can detect no specific distinctions. The characters of the species are indeed strongly marked, and once seen, cannot be forgotten. Would that others of this beautiful genus were equally constant ! It would save botanists a world of trouble and uncertainty. Here every articulation, without exception, through the whole plant, bears its pair of comb-like branchlets. Under the microscope, therefore, *Cal. Plumula* cannot well be mistaken. But, notwithstanding this perfect regularity of branching, specimens differ much in luxuriance, and consequently in outer aspect ; and we might enumerate *two* varieties, in one of which the combs are twice as long as in the other, and more delicate.

*Cal. simile* of the Antarctic Flora, a native of Kerguelen's Land, is an instance of a closely allied, and yet perfectly distinct species, and shows in a very forcible manner how similar two things in nature may be, without being the same ; how closely she can draw her lines without touching at any point !

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Fig. 1. CALLITHAMNION PLUMULA :—*of the natural size.* 2. Portion of a frond. 3. Portion of another specimen, with *favellæ*. 4. *Favellæ*, with surrounding plumules. 5. Plumule, bearing *tetraspores* on its ultimate ramuli. 6. Penultimate ramulus from the same, with tetraspores :—*all more or less highly magnified.*

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1.



2.



## PLATE CCXLIII.

ULVA LACTUCA, *Linn.*

GEN. CHAR. *Fron*d membranaceous, green, expanded, plane, (in some cases saccate when young,) composed of irregular cellules. *Fructification*; *granules*, often arranged in fours, scattered over the whole frond. *ULVA* (*L.*),—supposed to be from *Ul*, *water* in Celtic.

*ULVA lactuca*; “frond at first obovate, saccate, inflated, at length cleft down to the base; the segments plane, unequal, laciniated, semi-transparent.” *Grev.*

*ULVA lactuca*, *Linn. Sp. Pl.* p. 1632. *Lightf. Fl. Scot.* p. 970. in part. *Ag. Sp. Alg.* vol. i. p. 409. *Ag. Syst.* p. 189. *Lyngb. Hyd. Dan.* p. 30. in part. *Grev. Crypt. Scot.* t. 313. *Grev. Alg. Brit.* p. 172. *Hook. Br. Fl.* vol. ii. p. 311. *Harv. Man.* p. 170.

HAB. On rocks, stones, shells, and the smaller algæ between tide-marks. Annual. May and June. Generally distributed round the British coasts, but less common than *U. latissima*.

GEOGR. DISTR. Shores of Europe.

DESCR. *Fron*ds tufted, from two to six inches high, at first forming an obovate bag, closed at the summit, but soon bursting, and split quite to the base into two or more segments which are often irregularly lobed or divided, the margin sometimes entire, but oftener jagged. *Substance* very thin and delicate, semi-transparent, closely adhering to paper in drying. *Colour*, a peculiarly beautiful light yellowish green. The surface glossy when dry. Under the microscope the frond is seen to consist of closely packed, quaternate cells, lying in a transparent membrane.

To Dr. Greville belongs the merit, as far as British naturalists are concerned, of having first clearly pointed out the characters by which this delicate plant may be distinguished from the more common *U. latissima*, and therefore I have thought it best to preserve the diagnosis given by that author in his *Algæ Britannicæ*. The characters are most obvious in an early stage of growth, when the present plant forms an obovate sac, not very unlike a greatly distended *Enteromorpha*; while *U. latissima* is at all periods of its growth a flat membrane. Other characters are found in the substance and colour. *U. lactuca* is of a brighter and yellower green, and more glossy when dry; and its substance

is greatly more thin and delicate than that of *U. latissima*. The form of both plants is too variable to find a place among the distinctive characters. *U. latissima* is found at all seasons and on every shore; but *U. lactuca* is seldom seen except in spring or early summer.

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Fig. 1. ULVA LACTUCA, young and old plant:—*the natural size*. 2. Small portion of the membrane:—*magnified*.

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## PLATE CCXLIV.

DUDRESNAIA COCCINEA, *Bonnem.*

GEN. CHAR. *Frond* cylindrical, gelatinous, elastic; *axis* composed of a lax net-work of anastomosing filaments, coated with a stratum of closely combined, longitudinal fibres; the *periphery* of horizontal, dichotomous, moniliform filaments. *Fructification*, of two kinds, on different individuals; 1, globular masses of *spores* (*favellidia*) attached to the filaments of the periphery. 2, external zoned *tetraspores*, borne on the filaments of the periphery, generally terminating a ramulus. DUDRESNAIA (*Bonnem.*),—in honour of *M. Dudresnay*.

DUDRESNAIA *coccinea*; frond rosy red, tender and gelatinous, much and irregularly branched; branches alternate, flexuous, moniliform, attenuated upwards; ramuli more or less numerous.

DUDRESNAIA *coccinea*, *Bonnem. in Journ. Phys.* vol. xciv. p. 180. *Crouan, Nouv. Ann. Sc. Nat.* vol. iii. p. 98. t. 2. f. 3–4. *J. Ag. Alg. Medit.* p. 84. *Endl. 3rd Suppl.* p. 37.

MESOGLOIA *coccinea*, *Ag. Syst.* p. 51. *Hook. Br. Fl.* vol. ii. p. 386. *Wyatt, Alg. Damn.* no. 148. *Harv. in Mack. Fl. Hib.* part 3, p. 186. *Harv. Man.* p. 48.

RIVULARIA *verticillata*, *E. Bot.* t. 2466.

HAB. On rocks &c., near low-water mark; or, more generally, in 4–10 fathom water. Annual. Summer. Very rare. Brighton, *Mr. Borrer*. Sidmouth and Torquay, *Mrs. Griffiths* and *Miss Cutler*. Salcombe, *Mrs. Wyatt*. Plymouth, *Rev. W. S. Hore*. Falmouth, *Miss Warren*. Jersey, *Miss White* and *Miss Turner*. Bantry Bay, *Miss Hutchins*.

GEOGR. DISTR. Atlantic coasts of France.

DESCR. *Root*, a very small, conical disc. *Fronds* from six to ten inches high, much branched and bushy: sometimes with a single stem closely set with lateral branches, sometimes divided near the base into several stems. *Stem* or its divisions, set with alternate, patent branches, the lowest of which are longest, the upper gradually shorter. These bear a second and a third, and in luxuriant specimens a fourth series of smaller branches and ramuli; each series being more and more slender, and the last about as thick as bristles. In some specimens the branches and ramuli are very dense, in others they are distant and bare. In the young frond the axis is a simple, articulated filament giving off at its joints whorls of dichotomous, moniliform ramuli; but as it advances in age the central filament or axis divides into several, or others grow round it, and the whorls are much more densely set. Thus in young plants the branches appear moniliform like those of a *Batrachospermum*; but in old plants they are cylindrical. *Favellidia* large, lodged at the base of dense, much divided ramuli. *Tetraspores* transversely four-



parted, oblong, terminating the branches of the horizontal ramuli. *Colour*, a brilliant crimson, given out in fresh water. *Substance* gelatinous. The frond adhering closely to paper in drying.

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One of the rarest of the British Algæ, scarcely known except on the southern shores of England, and there only in a few stations, and nowhere in great abundance. Perhaps one cause of its comparative rarity is its place of growth. Being a deep-water species it is rarely found except when cast ashore after a gale, or when sought by dredging. In the former case the specimens are frequently very flaccid, and faded in colour. I am not aware of its having been found in Ireland except, many years ago, by Miss Hutchins.

There is considerable difference in structure and also in appearance between young and old plants. In the former the axis is a simple, jointed filament, not very unlike that of a *Griffithsia*, whorled at short intervals with beaded fibres. But as the plant increases in age, the axis becomes more compound until it consists of a bundle of closely packed filaments; and then the branches become thicker and more cylindrical. *Favellidia* are commonly produced in abundance. *Tetraspores* are much more rare.

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Fig. 1. DUDRESNAIA COCCINEA :—*of the natural size*. 2. Portion of a young branch, with tetraspores. 2. Ramulus from the same. 4. Tetraspores and portion of ramulus. 5. Portion of branch with favellæ. 6. Favella and ramuli from the same :—*all magnified*.

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## PLATE CCXLV.

ENTEROMORPHA RAMULOSA, *Hook.*

GEN. CHAR. *Frond* tubular, membranaceous, of a green colour, and reticulated structure. *Fructification*; granules, commonly in fours, contained in the cellules of the frond. ENTEROMORPHA (*Link*),—from *έντερον*, an *entail*, and *μορφή*, *form* or *appearance*.

ENTEROMORPHA *ramulosa*; frond subcompressed, highly reticulated, irregularly divided; the main divisions long, densely set with lateral branches; branches curved, curled or twisted, everywhere clothed with short, spine-like ramuli.

ENTEROMORPHA *ramulosa*, *Hook. Br. Fl.* vol. ii. p. 315. *Harv. Man.* p. 175. *Wyatt, Alg. Damn.* no. 208.

ENTEROMORPHA *clathrata*, γ. *uncinata*, *Grev. Alg. Brit.* p. 181.

ULVA *ramulosa*, *E. Bot.* t. 2137.

ULVA *uncinata*, *Mohr. Cat. Alg.* fide *Ag.*

HAB. Rocks and stones, between tide-marks. Annual. Spring.

GEOGR. DISTR. Shores of Europe.

DESCR. *Fronds* from six inches to one or two feet in length, densely tufted, and often woven together into an inextricable mat, irregularly branched. Main stems frequently undivided or but slightly divided, furnished throughout with densely set, short, horizontal branches of very unequal length, some of them being not half an inch and others two or three inches long. These branches bear an abundance of short, spine-like, simple or slightly branched, scattered, setaceous or capillary ramuli, very much more slender than the part from which they spring. The stem and branches all taper to a fine point. The colour is an intense grass-green, of much brilliancy, and well preserved in drying. The substance membranaceous, rather harsh to the touch from the abundance of short spreading ramuli that cover the branches. In drying the frond adheres, but not very closely, to paper.

A common form of *Enteromorpha*, but scarcely more than a form. Under Plate XLIII. of our first volume I have stated that I regard *E. ramulosa* as merely one of the varieties of *E. clathrata*, and that both the plants so called have so much in common with *E. erecta* and others of the genus, that it is doubtful whether all are not merely varieties of one Protean species. To this opinion I still adhere. Nevertheless, as the extreme



states described by botanists are outwardly dissimilar, I have determined to figure them all.

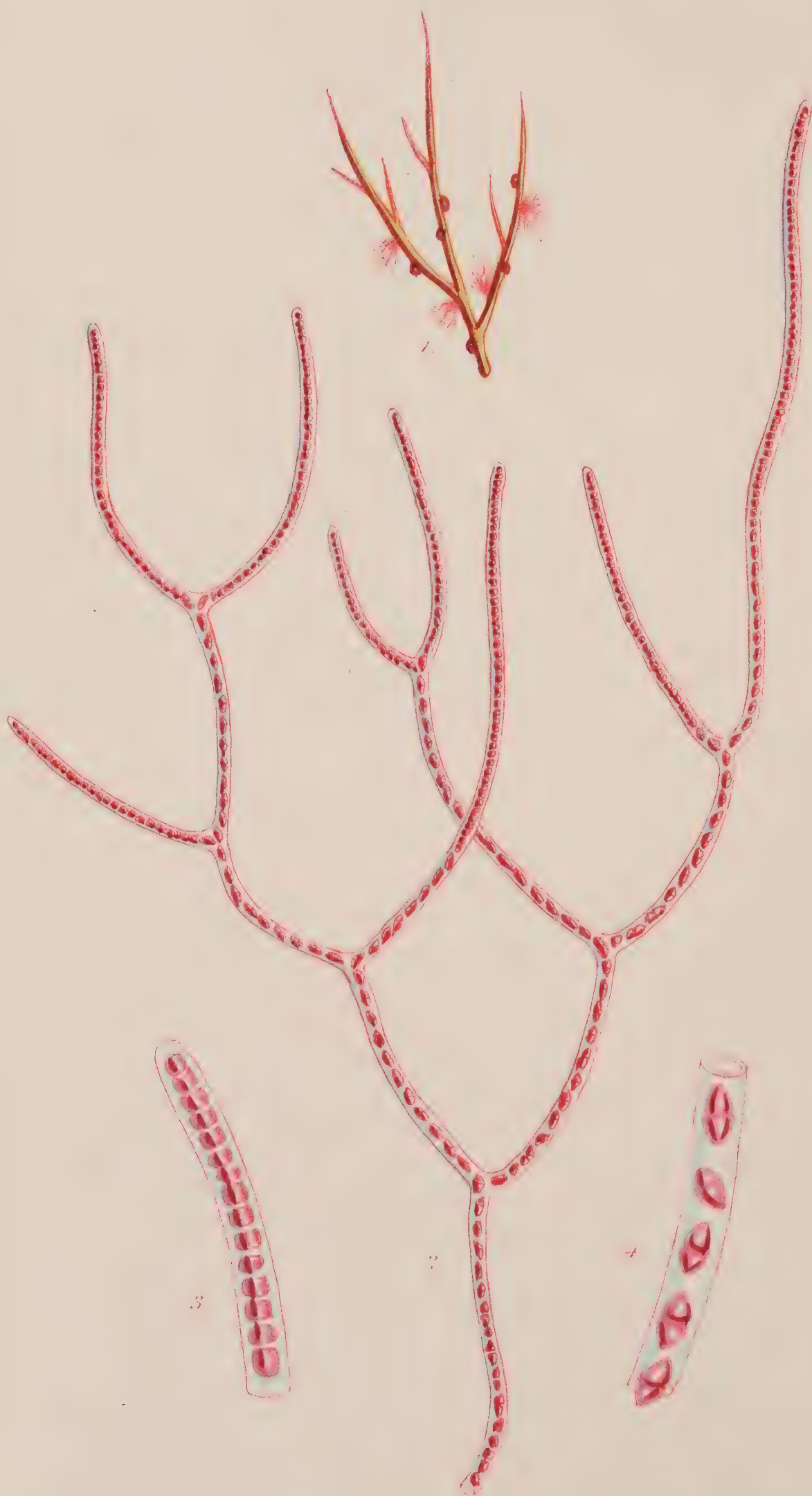
The present variety is distinguished by its squarrose habit, full green colour, and rather harsh feel. When young and untangled, as in our figure, it is not unsightly; but in age it often forms an inextricable fleecy mass, spreading widely over the surface of the ground, and forming a comfortable cover for a variety of small crustacea and shell-fish; but in this state it is not to be recommended to the seeker of specimens for the Herbarium.

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Fig. 1. ENTEROMORPHA RAMULOSA:—*of the natural size*. 2. Portion of the stem with small branches and ramuli. 3. Fragment of the surface of the frond. 4. Part of tranverse section:—*magnified*.

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## PLATE CCXLVI.

BANGIA (?) ELEGANS, *Chauv.*

GEN. CHAR. *Frond* filiform, tubular, composed (*in the typical species*) of numerous radiating cellules, disposed in transverse rows and enclosed within a hyaline, continuous sheath. *Spores* purple or green, formed within each of the cells of the frond. BANGIA (*Lyngb.*),—in honour of *H. Bang*, a Danish Botanist, and friend of *Lyngbye*.

BANGIA? *elegans*; filaments minute, dichotomously branched, with very patent axils; branches containing a single row of simple or binate, purple granular cells.

BANGIA *elegans*, *Chauv. Mem. Soc. Linn. Norm.* vol. vi. p. 13. *Alg. Norm. Fasc.* vii. no. 159. *Recherches*, p. 33.

HAB. Parasitical on the smaller algæ. Very rare. Dredged in Strangford Lough at Portaferry, adhering to *Gracilaria confervoides*, *Wm. Thompson, Esq.* (1838.)

GEOGR. DESCR. Coast of Normandy.

DISTR. Forming minute tufts, 1–2 lines long, resembling, to the naked eye, the tufts of *Callithamnion Daviesii* in colour and size. *Filaments* dichotomously branched, several times forked, the branches cylindrical, curved, spreading, with very wide axils, obtuse at the tips. The younger parts of the filament contain a string of closely-set lenticular granules or cells, arranged like those of a *Lyngbya*. In the older parts the cells are less regularly placed and are more distant, of a broadly spindle-like form with a division in the centre, as if composed of two conical or sugar-loaf bodies. These are probably the ripe *spores*, which escape on the bursting of the tubular filament. The colour of the spores is a purplish lake, becoming greenish in decay.

The only British specimen of this curious and beautiful little plant that I have seen, was dredged several years ago by my friend Mr. Thompson, of Belfast, who communicated it to me, and allowed me to retain a portion, from which the figure here given has been prepared. This I have compared with an authentic specimen of Chauvin's plant, received from M. Lenormand, and find them to agree in all essential particulars. The chief difference is in colour, the Irish specimen having lost its original purple and acquired a greenish shade; no uncommon effect of decay.

The genus *Bangia* has long been a receptacle for heterogeneous species, and though partially reformed by M. Chauvin in the excellent memoir above quoted, it can hardly be said that in making the present plant a species of *Bangia* he has more than indicated its near affinities. For though doubtless *allied* to *Bangia*, its structure is more simple than in the genuine members of the genus, and it stands nearer perhaps to *Sphæroplea* of Agardh. It might, however, be more properly regarded as the type of a new genus characterized by the binate spores.

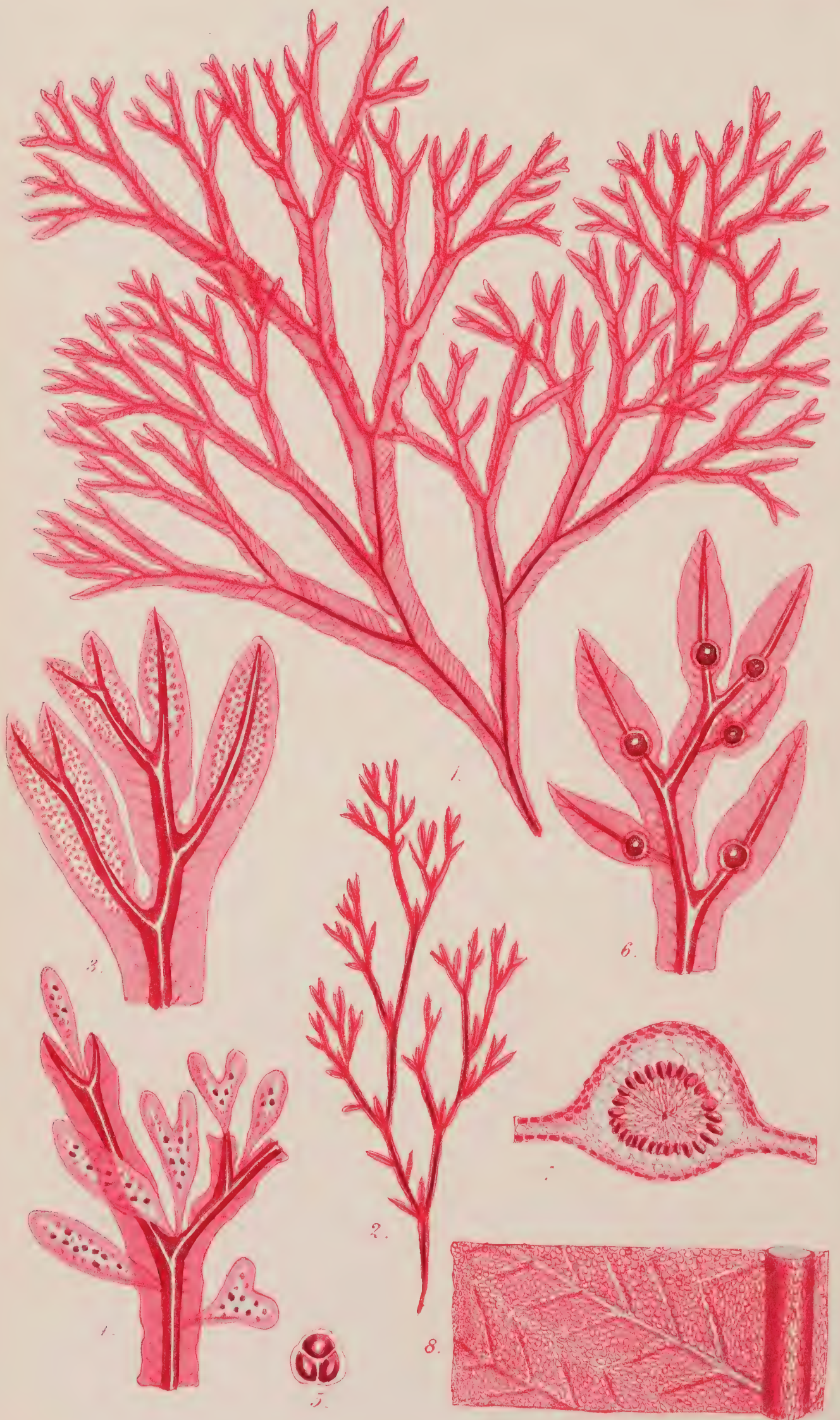
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Fig. 1. Tufts of BANGIA ELEGANS, growing on GRACILARIA CONFEROIDES :—  
the natural size. 2. A frond, *magnified*. 3. A young apex. 4. A portion  
of the older part of the frond :—*highly magnified*.

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## PLATE CCXLVII.

DELESSERIA ALATA, *Lamour.*

GEN. CHAR. *Fronde* rose-red, flat, membranaceous, with a percurrent midrib. *Fructification* of two kinds, on distinct individuals; 1, spherical *tubercles* (*coccidia*) immersed in the frond, and containing a globular tuft of angular spores; 2, *tetraspores*, forming defined spots in the frond, or in leaf-like processes. DELESSERIA (*Lamour.*),—in honour of Baron B. Delessert, a distinguished botanist and patron of Botany.

DELESSERIA *alata*; stem dichotomous, much branched, winged throughout with a narrow, membranous lamina which is pennate-nerved; tubercles rising from the midrib; tetraspores in sori occupying the apices of the frond, or in proliferous leaflets.

DELESSERIA *alata*, *Lamour. Ess.* p. 124. *Lyngb. Hyd. Dan.* p. 8. t. 2. *Ag. Sp. Alg.* vol. i. 178. *Ag. Syst.* p. 250. *Hook. Fl. Scot.* part 2. p. 100. *Grev. Fl. Edin.* p. 293. *Grev. Alg. Brit.* p. 73. *Hook. Brit. Fl.* vol. ii. p. 285. *Wyatt. Alg. Damn.* No. 14. *Harv. in Mack. Fl. Hib.* part 3. p. 191. *Harv. Man.* p. 55.

WORMSKIOLDIA *alata*, *Spreng. Syst. Veg.* vol. iv. p. 293.

HYPOGLOSSUM *alatum*, *Kütz. Phyc. Gen.* p. 445.

FUCUS *alatus*, *Huds. Fl. Ang.* p. 578. *Gmel. Hist.* p. 187. t. 25. f. 1. *Linn. Mant.* p. 135. *Syst. Nat.* p. 718. *Lightf. Fl. Scot.* p. 951. *Fl. Dan.* t. 352. *Stack. Ner. Brit.* t. 13. *Esper. Ic. Fuc.* vol. i. p. 20. t. 3. *Turn. Syn.* p. 144. *Turn. Hist.* t. 160. *E. Bot.* t. 1837.

HAB. On rocks and the larger Algæ, between tide-marks and in 4–10 fathoms water. All round the British Coasts.

GEOGR. DISTR. Atlantic shores of Europe and North America.

DESCR. *Root*, a small disc. *Fronde*, 4–8 inches high, 1–4 lines in breadth, very much branched in a more or less regularly dichotomous manner; the main divisions being frequently alternate, or almost pinnately disposed, the minor ones regularly and repeatedly forked. *Branches* gradually narrower to the tips, consisting of a strong percurrent midrib or stem bordered with a flat, wing-like lamina, which follows all the divisions, but is usually broader at one side of the rib than at the other, especially toward the axils, where there is a deep, rounded sinus. This is most obvious on broad varieties. Every part of the membrane is furnished with opposite, patent veinlets connecting the midrib with the margin of the lamina, and themselves connected by pellucid striæ. Normally the frond is perfectly distichous, all the branches extending in one plane; but old specimens are very frequently beset with crowded, irregularly inserted branchlets, issuing from all parts of the midrib proliferously; such plants are excessively bushy. *Tubercles*

immersed in the midrib, towards the tips of the branches, very convex. *Tetraspores* either contained in terminal sori, disposed at each side of the rib; or else in proper leaflets, irregularly grouped about the apices. *Colour*, in well grown specimens, a clear, deep crimson, varying to dark full red, and sometimes brownish. *Substance* membranaceous, adhering to paper. The cells of the frond are small and close, for the genus.

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One of our commonest species; and though not without beauty, yet one of the least attractive of the genus to which it belongs. When well grown, with a broad wing to the stems, as in the specimen selected for our upper figure, its claims to the possession of considerable beauty and grace will readily be admitted, but in average specimens the wing-like margin is much more narrow and is very liable to injury; the colour darker and more dingy; and the ramification less regularly dichotomous. Sometimes, from proliferous growth, the whole upper part of the frond is thick and bushy.

Under Pl. LXXXIII. of the first volume will be found a statement of my views respecting the claims of *D. angustissima* to specific rank,—claims, which I did not then admit, and which I am not now disposed to do. That supposed species I can only regard as a very narrow and aberrant form of the present plant, having either no membrane developed, or a very imperfect one. Were it true that no membrane was ever found in *D. angustissima*, then we should have an *absolute* character on which to found a species. But such is not the case, for I have specimens in which the commencement of membrane is evident on some of the branches, while other parts, equally perfect, are destitute of membrane. I consider *D. angustissima* therefore to be an extreme variety of *D. alata*, analogous to the narrow states of such plants as *Chondrus crispus*.

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Fig. 1. *DELESSERIA ALATA*; A broad variety. 2. Narrow variety;—*both the nat. size*. 3. Apex of branch with tetraspores. 4. Apex with the same, contained in proper leaflets. 5. A tetraspore. 6. Apex with tubercles. 7. Section of a tubercle. 8. Portion of the lamina and midrib:—*magnified*.

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2.

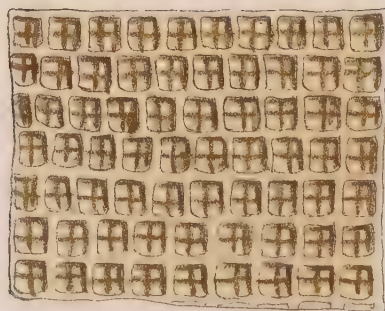


PLATE CCXLVIII.

PUNCTARIA TENUISSIMA, *Grev.*

GEN. CHAR. *Fronde* undivided, membranaceous, flat, ribless, with a naked, scutate root. *Fructification* scattered over the whole frond, in minute, distinct dots, composed of roundish, prominent spores, intermixed with club-shaped filaments. PUNCTARIA (*Grev.*),—from *punctum*, a dot; the fruit being in dots, scattered over the surface.

PUNCTARIA *tenuissima*; frond sublinear, very thin, transparent. *Grev.*

PUNCTARIA *tenuissima*, *Grev. Alg. Brit.* p. 54. *Hook. Fl.* vol. ii. p. 279. *Harv. Man.* p. 34.

PUNCTARIA *undulata*, *J. Ag. Spec.* vol. i. p. 72.

ULVA *plantaginifolia*, *Lyngb.* p. 31. t. 6. (*fide J. Ag.*)

DIPLOSTROMIUM *plantagineum*, *Kg. Phyc. Gen.* p. 298.

HAB. Parasitical on *Zostera marina*, *Chorda filum*, &c. near low-water mark. Annual. Summer. Bute, *Dr. Greville*. Appin, *Captain Carmichael*. Near Dublin, *W.H.H.*; probably common.

GEOGR. DISTR. Atlantic Shores of Northern Europe, Baltic Sea. North West Coast of France. North America.

DESCR. *Fronde*s, 2–8 inches long, 1–3 lines wide, very densely tufted, covering the plant on which they grow with innumerable slender wavy ribbons, tapering to the base and apex, but linear for the greater part of their length, sometimes ending bluntly; the margin waved or curled, and either entire, or remotely and irregularly toothed. *Colour*, a very pale shade of brownish olive, or horn-colour, sometimes hyaline. *Substance* exceedingly thin and delicate, adhering to paper. *Structure* beautifully areolated. *Fruit* unknown.

Two species of *Punctaria* have already appeared in this work, and the one now figured completes the representation of the British kinds. The present species has never been found in a state of fruit, and hence some botanists (among others my valued friend Mrs. Griffiths) regard it as the young of some other species; perhaps of *P. latifolia*, with which its substance more nearly agrees, than with that of *P. plantaginea*. But its great difference in form seems to forbid such an opinion being hastily adopted, particularly as young *P. latifolia* may be found of much smaller



size and with a broader and more ovate frond. I rather think that this ignorance of the fruit arises from imperfect observation. The plant does not seem to be found all round the coast, and where it has been observed has been in places only occasionally and hastily visited by botanists; and though I have myself gathered it in my immediate neighbourhood, I must plead guilty to having neglected to watch its growth from the commencement to disappearance. Capt. Carmichael, a very close observer, was persuaded of its distinct character; and I have specimens from North America and the Baltic closely resembling those from our own shores.

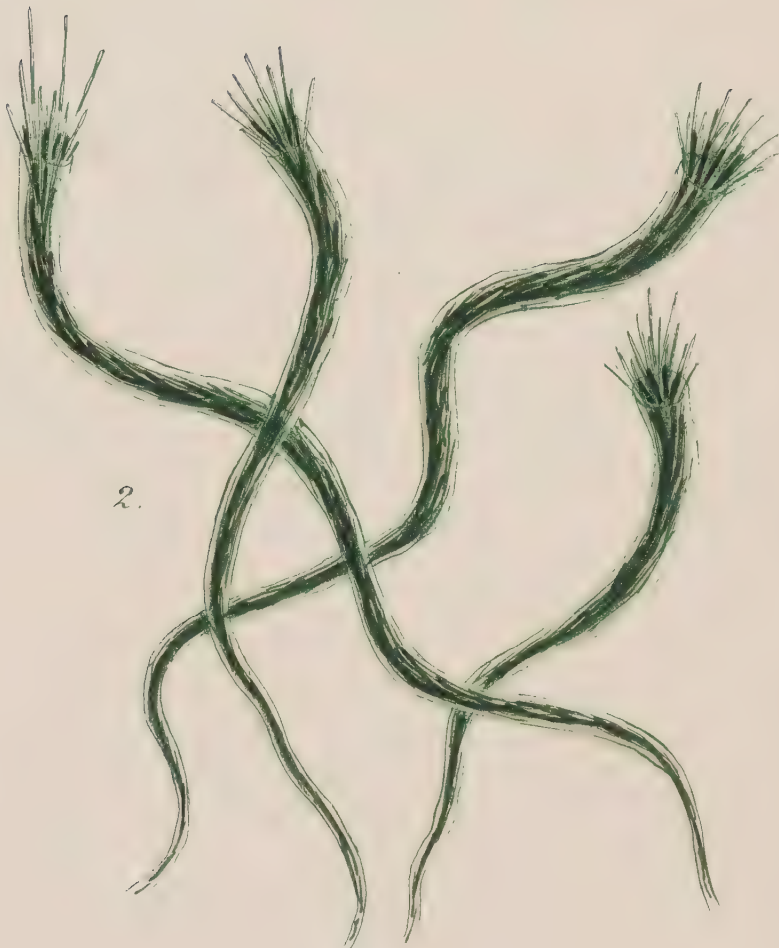
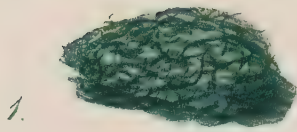
According to the younger Agardh the synonyme *Zonaria tenuissima*, Ag., quoted by Greville belongs rather to *Laminaria fascia*; for which reason the Swedish Algologist has substituted the name *undulata* for that here adopted.

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Fig. 1. PUNCTARIA TENUISSIMA; growing on *Chorda filum*:—*natural size*.  
2. Small portion of the membrane:—*magnified*.

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## PLATE CCXLIX.

MICROCOLEUS ANGUIFORMIS, *Harv.*

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GEN. CHAR. *Filaments* minute, rigid, straight, transversely striate, bundled, and enclosed within membranaceous, simple or branching sheaths, from whose apices they oscillate. MICROCOLEUS (*Desmaz.*),-- from μικρος, *small*, and κολεος, *a sheath*.

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MICROCOLEUS *anguiformis*; sheaths snake-like, simple, decumbent, tapering much to the extremity; filaments slender, with distant striæ.

MICROCOLEUS *anguiformis*, *Harv. MSS. Hass. Fr. Water Alg.* p. 261. t. 70. fig. 1.

HAB. Pools of brackish water, near the shore, at Dolgelly, *Mr. Ralfs*.

GEOGR. DISTR. Coast of Wales.

DESCR. This minute plant forms a dense stratum of a dark green colour on the surface of the mud. The sheaths are grouped together without order, decumbent, much entangled, and variously twisted into many snake-like folds, broad at the extremity from which the filaments oscillate, and tapering much towards the other end. The inclosed filaments are short, slender, and straight, with distant striæ. The colour is a dull blackish green, without gloss when dry.

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A minute but curious Alga, allied in many points to *Oscillatoria*, from which genus *Microcoleus* chiefly differs in possessing frond-like sheaths, containing threads bundled together. At first these sheaths appear scarcely more compound than a single filament, but as the plant advances, the sheath widens and is found full of a multitude of filaments. These oscillate, like those of an *Oscillatoria*, either from the wide mouth of the sheath, or from any accidental rupture which may happen in its side.

I am indebted to Mr. Ralfs for the only specimens I have seen of this plant, and am not aware of any habitat for it, save the one above recorded. It ought to occur in similar places, on

other parts of the coast, but unless closely looked after may easily escape detection.

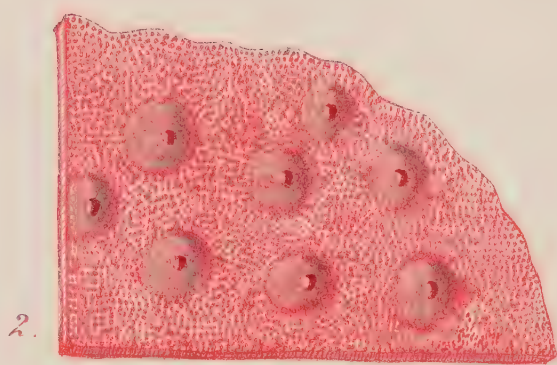
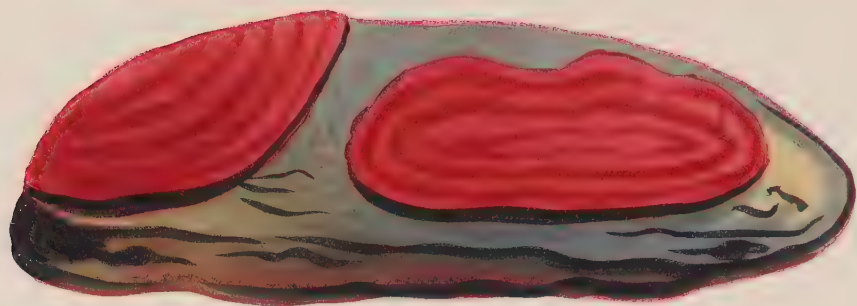
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Fig. 1. Portion of the stratum:—*natural size*. 2. Sheaths, or fronds. 3. Apex of a sheath, with protruding filaments:—*both magnified*.

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## PLATE CCL.

HILDENBRANDTIA RUBRA, *Meneg.*

GEN. CHAR. *Fronde* cartilagineo-membranaceous, (*not stony*), crustaceous, suborbicular, adhering by its lower surface; composed of very slender, closely packed, vertical filaments. *Conceptacles* immersed in the frond, orbicular, depressed, pierced by a hole and containing tetraspores and paraphyses at the base of the cavity. HILDENBRANDTIA (*Nardo*),—in honour of . . . . . ?

HILDENBRANDTIA *rubra*, Meneg.

HILDENBRANDTIA *rubra*, Meneg. *Mem. Riun. Nat. Padov.* 1841, p. 10. *Endl.* 3rd *Suppl.* p. 26. (*excl. Syn. Berk.*) *Kütz. Phyc. Gen.* p. 384. t. 78. f. V.

HILDENBRANDTIA *Nardi*, *Zanard. Alg. Adr.* p. 135.

RHODODERMIS *Drummondii*, *Harv. in Ann. Nat. Hist.* vol. xiv. p. 27. pl. 2.

HAB. On smooth stones and pebbles, between tide-marks, as well as in deep water. At all seasons? Common on the shores of the British Islands.

GEOGR. DISTR. Atlantic and Mediterranean shores of Europe.

DESCR. *Fronde* forming a thin, crustaceous expansion from half an inch to two inches or more in diameter, at first orbicular, and spreading in concentrically marked patches, but gradually sinuated and its surface irregularly corrugated as it advances in age; closely adhering by the whole of its under surface to the rock or stone on which it grows. A small portion viewed vertically with the microscope shows innumerable dot-like cells, imbedded in a clear, firm, gelatine: and thin slices, viewed laterally, prove the crust to be formed of very densely set, and closely cohering, slender filaments, composed of minute cells. When in fruit the surface is pitted with disc-like depressions, pierced in the centre by a hole which communicates with a chamber or immersed conceptacle hollowed out of the frond, and containing a few oblong, zoned tetraspores, among a number of paraphyses or abortive filaments. The part of the frond forming the walls of the conceptacle is of a much paler colour than the rest. *Colour* varies, according to locality, from a clear blood-red to a dark red brown. *Substance* coriaceo-membranaceous, very firm.

Common all round the coast, on stones and rocks within tide-marks, and also often dredged from deeper water. It forms a thin skin-like film, so closely applied to the surface of the body on which it grows that it is impossible to remove a specimen

without laceration. Its colours are sometimes much brighter than at others, especially (as observed by Dr. Drummond) in places where it is exposed to the dripping of fresh water.

The affinity of this obscure plant is rather doubtful, and I am by no means satisfied with the position which I have now assigned to it, next the *Nullipores*. It differs from those vegetables in wanting the lime which forms so remarkable a portion of their solid contents; but its cellular structure is not very unlike that of a *Nullipore*, and there is a near resemblance in the fructification. The cells composing the frond in the *Nullipores* or *Melobesiæ*, are longer and narrower than those of the *Hildenbrandtia*, but arranged in an order nearly similar.

Kützinger (Phyc. Gen. p. 384) makes three species; *H. sanguinea*, *H. rosea*, and *H. Nardi*, which to judge by the author's diagnoses, differ from each other merely in colour;—the first being "*ferrugineo-sanguinea*," the second "*coccineo-rosea*," and the third "*lutescenti-fusca, siccitate nigrescens*." This last may possibly be our *Ralfsia*.

I am not acquainted with the writings of the botanist to whom this genus is dedicated.

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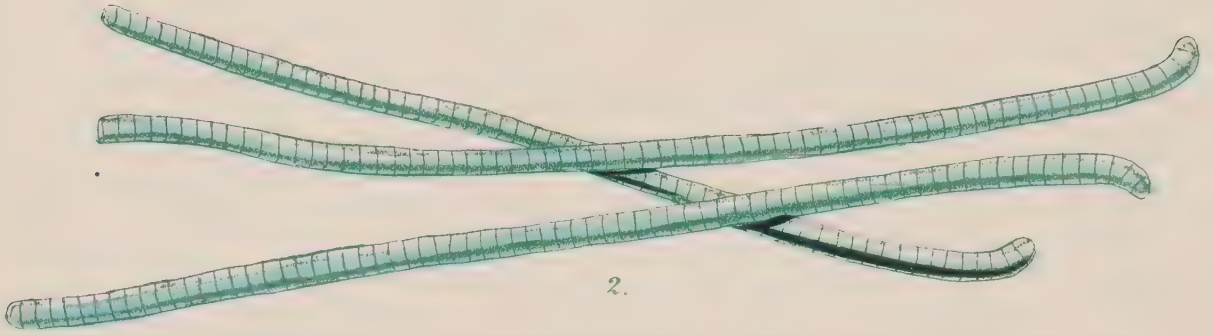
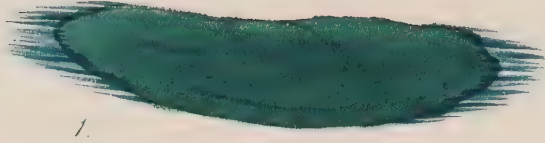
Fig. 1. *HILDENBRANDTIA RUBRA*, on a stone:—*natural size*. 2. Portion of the frond, with disc-like depressions. 3. Section of the same, cut through a conceptacle. 4. Tetraspores:—*all magnified*.

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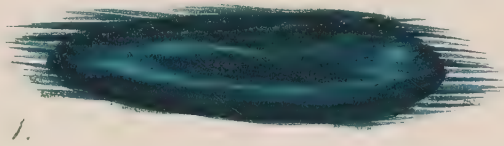




A.



B.



C.

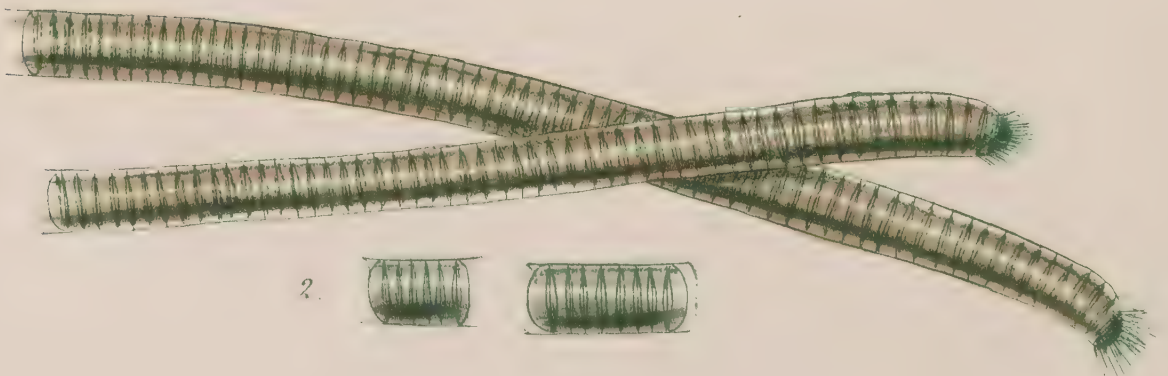
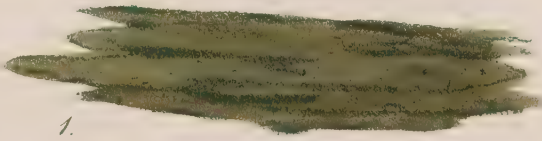


PLATE CCLI. *A*.OSCILLATORIA NIGRO-VIRIDIS, *Thw. n. s.*

GEN. CHAR. *Filaments* lying in a mucous matrix, rigid, simple, vividly oscillating. *Tube* continuous. *Endochrome* annulated with more or less close, parallel, transverse striæ. *Oscillatoria* (Vaucher),—from the motion observed in the filaments.

OSCILLATORIA *nigro-viridis*; *stratum* of a very dark olive-green colour; *filaments* delicate, pale green, rigid, with obtuse, curved apices; *striæ* inconspicuous, distant about half a diameter of the filament; *endochrome* very slightly granulose.

HAB. In a brackish ditch at Shirehampton near Bristol. Aug. 1847, G. H. K. Thwaites.

DESCR. *Stratum* thin, of a dark olive green, almost black colour, growing upon the mud and subsequently floating in large masses. *Filaments* of a pale dull green colour, with obtuse, distinctly curved, scarcely attenuated apices. *Striæ* not conspicuous, distant from each other about half a diameter of the filament. *Endochrome* scarcely granulose.

This species, which I have met with only once, bears some resemblance, as has been remarked to me by the Rev. M. J. Berkeley, to *Oscillaria uncinata*, of Kützinger, but the latter is a smaller species than ours, and has the striæ of its filaments more distinctly marked. *Thw.*

PLATE CCLI. *B*.

OSCILLATORIA *subuliformis*; *stratum* of an intense æruginous green colour; *filaments* bright green, subuliform; *striæ* inconspicuous, distant from one half to three quarters of a diameter of the filament; *endochrome* not evidently granulose.

HAB. In brackish ditches, at Shirehampton near Bristol, during the Summer and Autumn, not uncommon. G. H. K. Thwaites.

DESCR. *Stratum* thin, growing upon the mud, subsequently floating, appearing black in the water, but when taken out, of a beautiful deep blue-green colour. *Filaments* very delicate, bright green, gradually attenuated towards the apices, which are subacute and much curved. *Striæ* inconspicuous, distant from each other about three-fourths of a diameter of the filament. *Endochrome* uniform, not visibly granulose.



This beautiful species, the filaments of which oscillate very vividly, is an extremely interesting object under the microscope. The curved ends of the filaments may then be seen to move in a spiral direction, showing that this is the real motion of the filaments, though they may appear to an inattentive observer to have merely a waving lateral movement. Without the sanction and kind assistance of Mr. Berkeley, I should scarcely have ventured to describe this and the foregoing species as new, but he has kindly compared them with authentic specimens in his own herbarium, and considers them hitherto undescribed. *Thw.*

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PLATE CCLI. C.

OSCILLATORIA *insignis*; *stratum* of a dark brown, almost black colour; *filaments* brown, of considerable diameter, their apices obtuse, slightly oblique, and ciliated. *Striæ* conspicuous, very close; *endochrome* distinctly granulose.

HAB. In a brackish ditch at Shirehampton near Bristol, in Nov. 1848. *G. H. K. Thwaites.*

DESCR. *Stratum* thin, covering decaying vegetable matter at the bottom of the ditch in which it occurred, with a dark brown coating, becoming somewhat greenish in drying. *Filaments* very large, rather brittle; their apices rounded, somewhat oblique and furnished with numerous delicate motionless cilia. *Endochrome* distinctly granulose; the granules being principally evident close to the *striæ*, which they render more conspicuous.

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The cilia which terminate the filaments of this fine species, are not peculiar to it alone. Professor Kützing has figured in his "Phycologia Generalis" similar appendages to the filaments of *Oscillaria subfusca*, and has noted their occurrence in another species. Careful observation shews that these cilia have no proper motion of their own, and therefore can exercise no agency on the movements of the filaments; they appear to be mere appendages, or terminations of the membranous tube, and to perform no important function in the economy of the plant. *Thw.*

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## PLATE CCLII.

JANIA RUBENS, *Lamour*.

GEN. CHAR. *Fronde* filiform, articulated, dichotomously branched, coated with a calcareous deposit. *Fructification*, urn-shaped *ceramidia* formed of the axillary articulation of the uppermost branches (mostly two horned), pierced at the apex by a minute pore, and containing a tuft of erect, pyriform, transversely parted *tetraspores*. JANIA,—(*Lamour*), from *Janira*, one of the *Nereides*.

JANIA *rubens*; articulations of the principal branches and ramuli cylindrical, about four times as long as broad.

JANIA *rubens*, *Lam. Cor. Flex.* p. 272. *Gray, Brit. Pl.* vol. i. p. 339. *Flem. Brit. An.* p. 514. *Johnst. Brit. Lith.* p. 224. *Dne. Ess.* p. 111. *Endl. 3rd Suppl.* p. 49. *Kütz. Phyc. Gen.* p. 389.

CORALLINA *rubens*, *Ellis and Soland. Zooph.* p. 123. *Turt. Brit. Faun.* p. 211. *Lam. An. s. Vert.* 2nd edit. vol. ii. p. 517.

HAB. Parasitical on the smaller Algæ, between tide-marks. Perennial. Summer. On all parts of the British Coast.

GEOGR. DISTR. Shores of Europe. South Africa.

DESCR. *Fronde*s from half an inch to an inch and a half in height, densely tufted, dichotomous, many times forked, fastigate; branches either erect or spreading, gradually attenuated toward the apices. *Articulations* cylindrical in all parts of the frond, without prominent angles; those near the base very short, the upper ones gradually longer; those in the middle parts of the frond from four to five times longer than broad. *Apical* articulations either acute or obtuse, sometimes much attenuated, and sometimes nearly as robust as in other parts of the frond. *Ceramidia* subterminal, urnshaped, with long horns formed of from two to four articulations. When deprived of its lime by acid, the frond is distantly banded with dark, transverse striæ. *Colour* a pale red, with purplish shades when quite fresh.

The commonest species of the genus *Jania* and the most widely diffused, abounding along the shores of Europe and having been brought also from the Southern Ocean. I have specimens from South Africa which nearly accord with those from our own coasts. It probably occurs on the American shore in equal abundance.

From *J. corniculata* (tab. nost. CCXXXIV.) which it outwardly much resembles, *J. rubens* may, at once, be known by the

long, cylindrical lower articulations; and this much is generally sufficient to ascertain the species. But I observe, on some specimens, especially those from the South of England, an occasional prolongation of the upper angles of the articulation, showing a tendency to approach *J. corniculata*. Still, I have never seen a thoroughly intermediate specimen.

Several exotic species nearly resemble *J. rubens* in habit, differing chiefly in size and in the comparative length of the articulations.

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Fig. 1. JANIA RUBENS, growing on *Cladostephus*:—*of the natural size*. 2. A branch. 3. Ceramidium. 4. The same, after maceration in acid. 5. Tetraspores. 6. An articulation, from which a transverse slice has been removed, showing the internal structure:—*all magnified*.

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## PLATE CCLIII.

DASYA COCCINEA, *Ag.*

GEN. CHAR. *Fron*d filamentous; the stem and branches mostly opaque, irregularly cellular (rarely pellucid and longitudinally tubed), composed internally of numerous parallel tubes surrounding a central cavity; the ramuli jointed, single tubed. *Fructification* two fold, on distinct plants: 1, ovate *capsules* (*ceramidia*) furnished with a terminal pore, and containing a tuft of pear-shaped spores; 2, lanceolate *Pods* (*stichidia*) containing tetraspores ranged in transverse bands. DASYA (*Ag.*),—from *δαρς*, hairy.

DASYA *coccinea*; stems elongate, robust, rough with hair-like fibres, distichously branched; branches bi-tri-pinnate; pinnulæ multifid, single-tubed, their articulations as long as broad.

DASYA *coccinea*, *Ag. Spec. Alg.* vol. ii. p. 119. *Harv. in Hook. Br. Fl.* vol. ii. p. 335. *Wyatt, Alg. Damn.* No. 41. *Harv. in Mack. Fl. Hib.* part 3. p. 209. *Harv. Man.* p. 97. *Endl. 3rd Suppl.* p. 44.

ASPEROCAULON *coccineum*, *Grev. Fl. Ed.* p. 309.

ELLISIUS *coccineus*, *Gray, Br. Pl.* vol. i. p. 334.

TRICHOTHAMNION *coccineum*, *Kütz. Phyc. Gen.* p. 415.

HUTCHINSIA *coccinea*, *Ag. Syn.* p. 26. *Hook. Fl. Scot.* part 2. p. 89. *Ag. Syst.* p. 147.

CALLITHAMNION *coccineum*, *Lyngb. Hyd. Dan.* p. 124.

CONFERVA *coccinea*, *Huds. Fl. Ang.* p. 603. *With.* vol. iv. p. 141. *Dillw. Conf.* t. 36. *E. Bot.* t. 1055.

CONFERVA *plumosa*, *Ellis, Phil. Trans.* vol. lvii. p. 425. t. 18. f. c. C. d. D. *Lightf. Fl. Scot.* p. 996.

CERAMIUM *hirsutum*, *Roth, Cat. Bot.* vol. ii. p. 169. t. 4.

Var. *β. squarrosa*; branches destitute of hair-like fibres, sparingly and often irregularly branched; ramuli squarrose.

CERAMIUM *patens*, *Grev. Crypt. Scot.* t. 261.

HAB. On rocks and Algæ near low-water mark; *β.* dredged in deep-water. Annual. Summer. Common.

GEOGR. DISTR. Atlantic shores of Europe, from Norway to Spain.

DESCR. *Root*, a conical disc. *Stem*, six to eight inches long or more, mostly undivided, as thick as small cord at the base, gradually attenuated, opaque, and clothed with short, shaggy hairs, pretty regularly tri-pinnate pinnæ long, spreading, lanceolate closely pinnulated; the ultimate pinnulæ forked or multifid, or cloven to the base into numerous simple, single-tubed ramuli. *Articulations* visible in the smaller branches only, many tubed, and very short, interrupted by transverse bands of small, irregular cells. A trans-

verse section of the stem exhibits nine radiating siphons disposed round a small cavity, and surrounded by a band of small cells, of thickness varying according to the age of the part from which the section is made. Articulations of the ramuli very short. *Ceramidia* ovate, with thick walls. *Stichidia* oblong, suddenly mucronate, nearly sessile. *Colour*, a fine deep crimson, becoming brighter after immersion in fresh-water.  $\beta$ . is much smaller and more squarrose in its branching, sometimes nearly bare of ramuli.

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A well-known plant, common along the coasts of Europe, and a great favourite with collectors of Sea-weeds for ornamental purposes.

I have mentioned but one variety, as worthy of note; but this variety puts on so many forms that it might be split into two or three. In Dr. Greville's figure (Crypt. Scot. t. 261,) the species appears in its most depauperated state, so different in aspect from the normal condition, that without an inspection of connecting links, it would be difficult to suppose the two forms belonged to one species. But by dredging in sandy bays and among *Nullipores* a complete series of forms, connecting the most luxuriant with the most lank, may be collected. Those from deep-water are generally very irregularly branched, and seldom produce fruit. Specimens having *stichidia* are always more slender and delicate than those that bear *ceramidia*.

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Fig. 1. *DASYA COCCINEA*. 2. The var.  $\beta$ . *squarrosa* :—both of the natural size. 3. *Ceramidium* with accompanying ramuli. 4. Section of *ceramidium*. 5. *Stichidium*, with ramuli. 6. A tetraspore. 7. Section of lower part of the stem. 8. Section of a branch :—all magnified.

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PLATE CCLIV.

CALOTHRIX CONFERVICOLA, *Ag.*

GEN. CHAR. *Filaments* destitute of mucous layer, erect, tufted, or aggregated, fixed at the base, somewhat rigid, not oscillating. *Tube* continuous; endochrome green, densely annulated, at length dissolving into lenticular sporidia. CALOTHRIX (*Ag.*),—from *καλος*, *beautiful*, and *θρίξ*, *a hair*.

CALOTHRIX *confervicola*; filaments short, glaucous, opake, filiform, blunt, rigid, straight or slightly curved, tufted.

CALOTHRIX *confervicola*, *Ag. Syst.* p. 70. *Harv. in Hook. Br. Fl.* vol. ii. p. 367. *Harv. in Mack. Fl. Hib.* part 3. p. 237. *Harv. Man.* p. 156. *Wyatt, Alg. Damn.* No. 229.

LEIBLEINIA *confervicola*, *Endl. Gen.* No. 57. 3rd *Suppl.* p. 21.

LEIBLEINIA *purpurea*, *chalybea* et *æruginea*? *Kütz. Phyc. Gen.* p. 221.

OSCILLATORIA *confervicola*, *Ag. Syn.* p. 110. *Lyngb. Hyd. Dan.* p. 94.

CONFERVA *confervicola*, *Dillw. Conf.* t. 8. *Roth, Cat. Bot.* vol. iii. p. 193. *Fl. Dan.* t. 1484. f. 1. *E. Bot.* t. 2576.

HAB. On small Algæ, between tide-marks; very common. Annual. Summer and autumn.

GEOGR. DISTR. Shores of Europe and North America.

DESCR. *Filaments* densely tufted, somewhat stellate, a line or two in length, filiform, slightly tapering upwards, straight or slightly curved, not twisted, rigid, free or slightly connected together by the edges towards the base, unbranched or sometimes throwing out from the centre of the filament a fascicle of short ramuli, seemingly a proliferous evolution of the endochrome. Now and then, but rarely, roundish bodies, resembling conceptacles (represented at fig. 3) are found attached to the sides of the filaments: their exact nature is not determined. *Endochrome* very dense, of a dark green-colour, reflecting glaucous tints from the surface, closely annulated.

Very abundant on the smaller algæ towards the end of summer, especially on *Ceramium rubrum*, whose fronds are sometimes completely hidden beneath the dense, dark-green pile, formed by this parasite. Such specimens have somewhat the habit of a *Cladostephus*, so densely and equally covered are they. Under water they reflect glaucous tints.

I have ventured to figure globular bodies, which I never saw



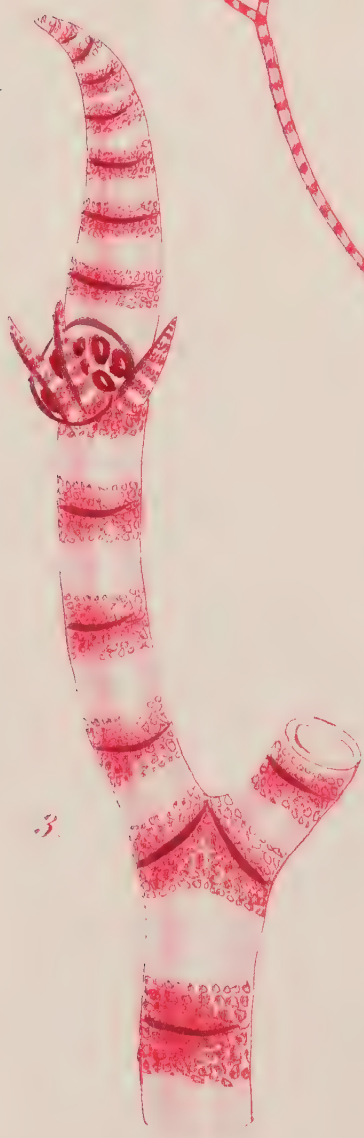
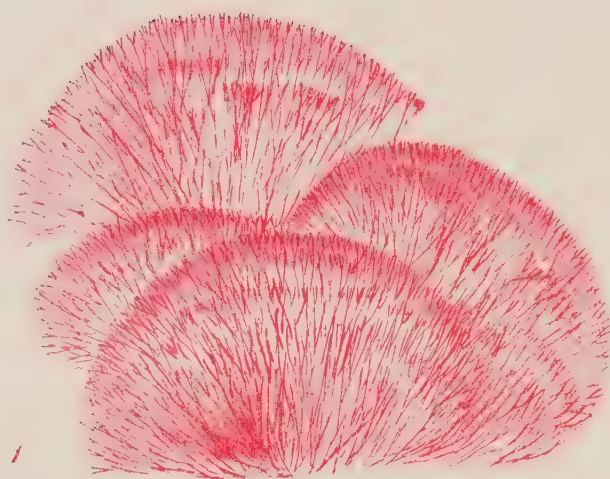
but once, though I have repeatedly sought for them. They were originally noticed many years ago by Sir W. J. Hooker, and figured from his drawing, in one of the supplementary plates of Dillwyn's *Confervæ*, and on the faith of that figure the plant has been erected into a genus by Bory,—a measure sanctioned by Endlicher,—and placed in the neighbourhood of *Ectocarpus*. Whatever the nature of these bodies may be, I think that this little plant can scarcely be removed from its congeners without violence; and certainly am unwilling to admit a relationship to *Ectocarpus*. The spore-like bodies may be of the nature of buds, or excrescences, and may possibly be afterwards changed into the tufted ramuli, which are frequently found, as it were, bursting from the sides of the filament.

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Fig. 1. *CALOTHRIX CONFERVICOLA*, growing on *Ceramium rubrum*:—*the natural size*. 2. Portion of a fascicle. 3. A proliferous filament; and portion of filament with supposed spores. 4. More highly magnified segment of filament:—*magnified*.

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## PLATE CCLV.

CERAMIUM FASTIGIATUM, *Harv.*

GEN. CHAR. *Frond* filiform, one-tubed, articulated; the dissepiments coated with a stratum of coloured cellules, which sometimes extend over the surface of the articulation. *Fructification* of two kinds on distinct individuals; 1, *tetraspores* either immersed in the ramuli or more or less external; 2, sessile, roundish *receptacles* (*favellæ*) having a pellucid limbus, containing minute, angular spores, and subtended by one or more short, involucral ramuli. CERAMIUM (*Roth*),—from *κεραμος*, a *pitcher*; but the fruit is *not* pitcher-shaped.

CERAMIUM *fastigiatum*; frond capillary, of equal diameter throughout, flaccid, dichotomous, level-topped; the axils acute; articulations pellucid, those of the middle of the stem from four to six times longer than broad, the upper gradually shorter, and coloured; dissepiments coated with coloured cells; favellæ small, subterminal, subtended by three or four involucral ramuli.

CERAMIUM *fastigiatum*, *Harv. in Hook. Lond. Journ. Bot.* vol. i. p. 303. *Wyatt, Alg. Danm.* no. 86. *Harv. Man.* 1st ed. p. 99.

GONGROCERAS *fastigiatum*, *Kg. in Linn.* xv. p. 736. *Phyc. Gen.*

HAB. On rocks, &c., near low-water mark; rare. Annual. Autumn and winter. Torquay, *Mrs. Griffiths*. Mt. Batten, Plymouth, *Rev. W. S. Hore*. Frith of Forth, *Dr. Greville*.

GEOGR. DISTR. Mediterranean Sea, *Kützing*. East coast of North America.

DESCR. *Filaments* 4–5 inches high, as thick as human hair, densely tufted, of equal diameter throughout, fastigiate, many times dichotomous, regularly forking from the base to the apex, mostly bare of lateral branchlets, but sometimes having a few, short, simple or forked ramuli. The lower axils distant, and somewhat spreading; the upper close together and narrow, acute. *Apices* generally emarginate, the points straight, or slightly curved, somewhat hooked, but not rolled inwards. Lower *articulations* from three to six times as long as broad, pellucid and colourless, furnished occasionally with a few scattered granules; upper articulations gradually shorter, the pellucid spaces suffused with pale, watery endochrome; the uppermost very short and strongly coloured. *Favellæ* of small size, sessile near the apex of the frond, having a few short, involucral ramuli. *Tetraspores* I have not seen. *Substance* tender, and flaccid, closely adhering to paper. *Colour*, in the tuft, a dark purple, fading in the herbarium to brick-dust colour; in the filament, a clear purplish lake.

This is one of the rarest and most beautiful of the British species of *Ceramium*. It is nearly related to *C. nodosum*, particularly in ramification, and in the diameter of its filaments; but

the substance is much more soft and tender than in that species, and the colour much brighter. The upper joints, moreover, in the present species are suffused with a beautiful carmine, and the axils are far less patent. The tufts are perfectly fastigate, forming regular circular fans when displayed on paper.

The merit of having first correctly distinguished the present plant is due to Mrs. Griffiths, who has for many years studied the species of the puzzling genus *Ceramium* with great care, and who is, therefore, more competent than most botanists to judge of the proper limits of the species. Whether this plant be the *Conferva fastigiata* of Roth (Cat. Bot., vol. ii. p. 224), I am unable to decide, having never seen an authentic specimen of that author's naming, but I suspect that half-a-dozen *Ceramia* which are now regarded as species, have been at different times referred to Roth's synonym. Our present plant is by no means confined to one locality. The specimens from the several stations above noted, are all of the same character, and I have also had the pleasure of receiving from my liberal correspondents, Professor Bailey of New York, and Mr. Olney of Rhode Island, U.S., North American specimens in all respects similar to our British ones.

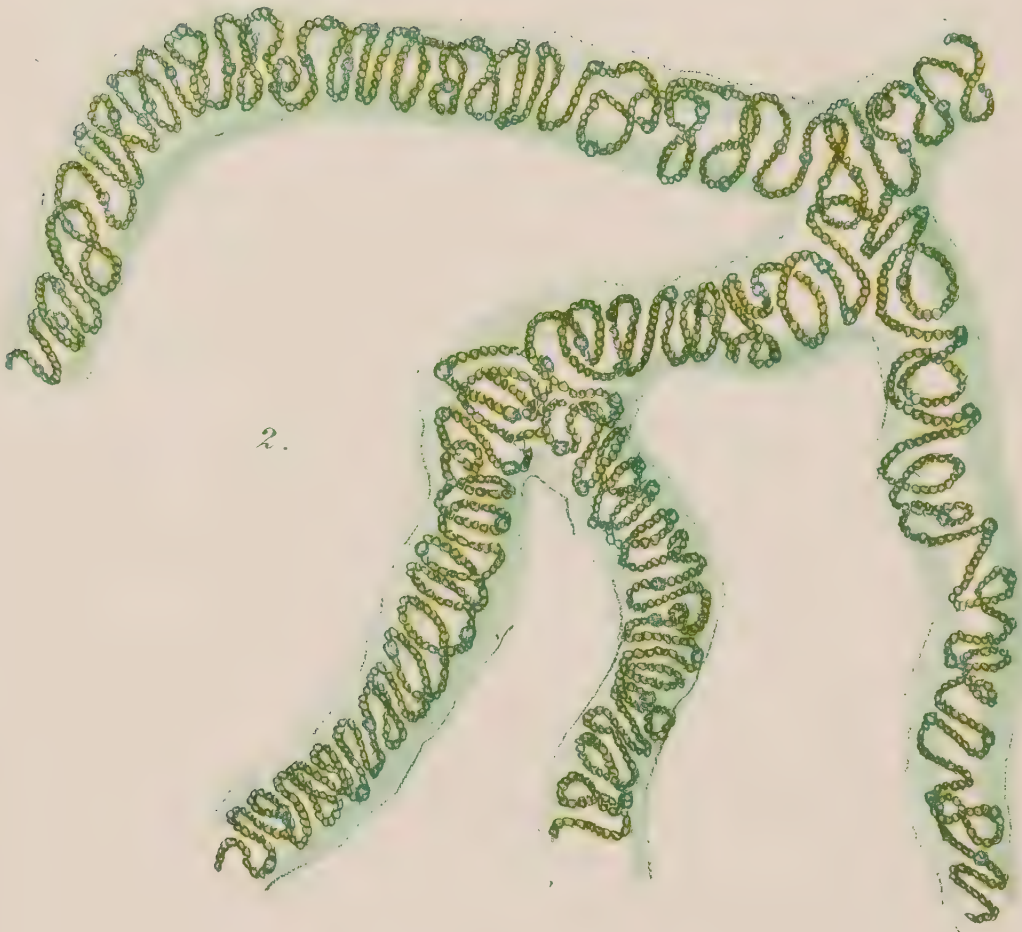
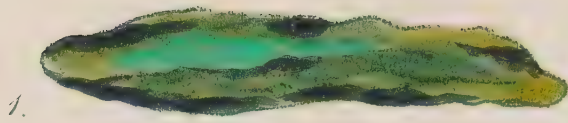
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Fig. 1. Tuft of CERAMIUM FASTIGIATUM :—*of the natural size*. 2. Portion of a filament :—*magnified*. 3. Apex of the same, with favella. 4. Articulation from the lower part of the same :—*both highly magnified*.

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## PLATE CCLVI.

MONORMIA INTRICATA, *Berk.*

GEN. CHAR. *Fronde* gelatinous, branched; the branches containing a spiral moniliform filament, composed of spherical, coloured cells, interrupted here and there by a cell of a different kind, and of larger size. *Spores* formed from the ordinary cells. MONORMIA (*Berk.*),—from *μονος*, one, and *οππος*, a necklace.

MONORMIA *intricata*.

MONORMIA *intricata*, *Berk. Gl. Brit. Alg.* p. 46. t. 18. *Harv. Man.* ed. 1. p. 185. *Hass. Brit. Fresh Water Algæ*, p. 285. pl. 75. f. 11.

HAB. At Gravesend, in the ditches of the marsh to the south of the Frindsbury canal, in great abundance, in June, 1832, *Rev. M. J. Berkeley*. Ditch (brackish) near Lighthouse, Shirehampton, Bristol, *Mr. G. H. K. Thwaites*.

GEOGR. DISTR. Not noticed out of England?

DESCR. “Forming small, roundish, gelatinous masses floating amongst different species of *Lemna* in fresh water, but probably within the influence of the tide; and also amongst *Enteromorpha intestinalis*, and even within its frond, in brackish water. The plant is at first of an olive yellow, gradually assuming a greener tint, and when dried, of a deep verdigris. Very gelatinous, delicately branched; the branches very flaccid. Under a high magnifier the whole plant is evidently composed of gelatine, in the centre of which runs a single moniliform filament following the ramifications, and in its progress curling to and fro repeatedly across the thread; the joints being nearly globular. The specimens from the interior of *Enteromorpha intestinalis* are paler, and have often longer joints amongst the globular ones.”—*Berk.* In young specimens the moniliform thread is found composed of a string of spherical, olive-green cells, of equal size, here and there interrupted by a larger, subquadrate cell, much paler than the rest. As it advances in age the cells, nearest the quadrate cell enlarge, become ellipsoid, and filled with a dense endochrome; in fact, converted into spores. The process of change into spores goes on at each side of the quadrate cell (which remains unchanged), until the whole of the filament is turned into a string of spores. If these simply organized plants have sexes, the functions of the male probably reside in these quadrate cells.

This curious plant has but a slender claim for admission into this work, being commonly a fresh-water production; but the specimens here figured having been obtained from the same salt-water ditches which have already supplied us—through the kindness of Mr. Thwaites,—with several interesting subjects, I have thought that there could be no objection to giving a figure of a

plant interesting by its structure and beauty, and so closely allied to the *Sphærozygæ*, which have already appeared. *Monormia* seems to differ from *Sphærozyga* chiefly in possessing a gelatinous branching matrix, so loose in structure that it can hardly be called a frond, surrounding the spirally-twisted filament. This filament is of indefinite length, having many connecting cells: the filaments of the *Sphærozygæ*, on the contrary, are generally short, with seldom more than one or two connecting cells. The fructification in both appears formed on the same type.

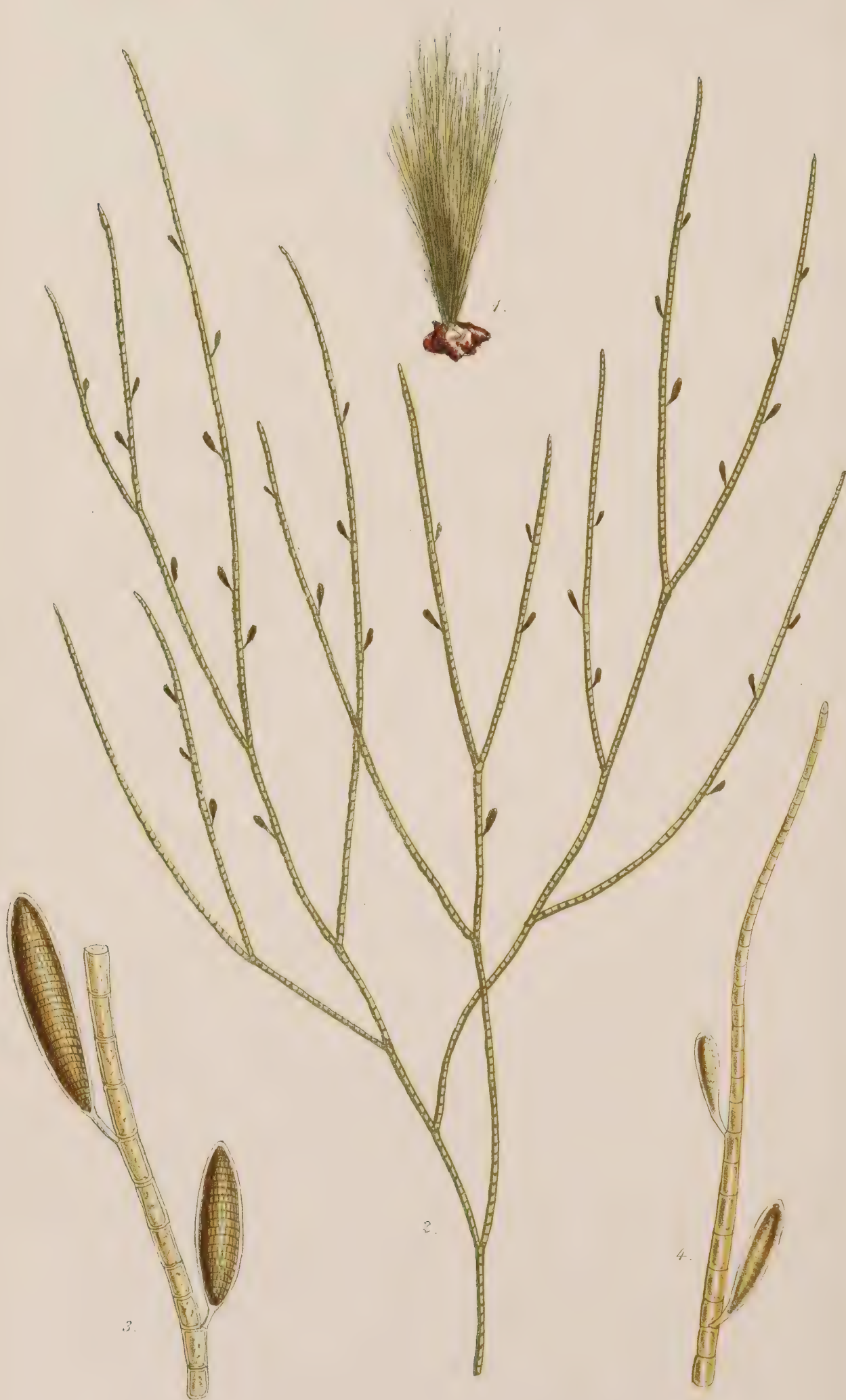
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Fig. 1. Stratum of MONORMIA INTRICATA as it appears to the eye. 2. Part of a branching frond:—*magnified*. 3. Portion of the filament from the same:—*very highly magnified*.

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## PLATE CCLVII.

ECTOCARPUS FENESTRATUS, *Berk.*


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GEN. CHAR. *Fronde* capillary, jointed, olive or brown, flaccid, single-tubed, without longitudinal striæ. *Fruit* either spherical or elliptical, external or imbedded spores; or lanceolate, linear, or conical *silicules* (pod-like bodies); or granular masses formed in consecutive cells of the branches. ECTOCARPUS (*Lyngb.*),—from *εκτος, καρπος*, *external fruit*.

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ECTOCARPUS *fenestratus*; pale green, very slender, forming small tufts; filaments not much branched; branches distant, alternate, furnished with a few long and simple, alternate ramuli; articulations of the branches twice or thrice as long as broad, pellucid; silicules stalked, scattered, at first clavate, then elliptic-oblong, obtuse, densely striate transversely, and cross-barred, dark brown.

ECTOCARPUS *fenestratus*, *Berk. in Herb. Griff. MSS. Harv. Man. Ed. 2. p. 58.*

HAB. Salcombe, *Mrs. Wyatt*. Annual. May.

DESCR. *Filaments* forming small tufts, very slender, one or two inches high, not very much branched; the branches lying apart and somewhat feathery, alternate, repeatedly divided, all the divisions erect, the ultimate ramuli prolonged and straight. *Articulations* variable (as in all the genus), usually in the middle part of the stems twice or thrice as long as broad, full of a pale olive, translucent endochrome, with a very few grains dispersed through it; in the upper part gradually shorter. *Silicules* pedicellate, at first club-shaped and narrow, afterwards becoming elliptic-oblong, or somewhat fusiform, but always very blunt at each end. When fully ripened they are dark coloured, marked with closely set, transverse and longitudinal striæ, which mark the surface with small, square reticulations, like a mosaic pavement, or the lattice of a window; an appearance alluded to in the specific name. *Colour*, pale greenish olive. *Substance* flaccid, closely adhering to paper.

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The characters by which this plant is distinguished from others of the genus—namely, simplicity in branching and the peculiar form of the silicule,—appear sufficiently well marked; and we may therefore hope that we have here the foundation of a good species which will be detected in other localities, and in greater abundance than has yet been the case. At present I have only seen a single small specimen, or rather half a specimen, for the tuft that I owe to the kindness of Mrs. Griffiths



is cut in two :—and Mrs. Wyatt has only met with it once. This is, however, not to be wondered at, if we consider the extremely local nature of many species of *Ectocarpus*, and that Salcombe, the habitat of our novelty, is a considerable distance from the discoverer's ordinary abode. In appearance *E. fenestratus* is not unlike many specimens of *E. siliculosus*, but the form of the silicule is very different ; and in this character there is a much nearer approach to *E. tomentosus*, a species, which in all other respects, is widely different from *E. fenestratus*.

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Fig. 1. ECTOCARPUS FENESTRATUS ; a tuft :—*the natural size*. 2. Portion of a filament :—*magnified*. 3. Small part of the same, with two ripe silicules. 4. Apex, with two young silicules :—*both highly magnified*.

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## PLATE CCLVIII.

ECTOCARPUS LONGIFRUCTUS, *Harv.*

GEN. CHAR. *Filaments* capillary, jointed, olivaceous or brown, flaccid, without longitudinal striæ. *Fruit* either spherical or elliptical, external or imbedded spores; or lanceolate, linear, or conical *silicules* (pod-like bodies); or granular masses formed in consecutive cells of the branches. ECTOCARPUS (*Lyngb.*),—from *εκτος*, *καρπος*, *external fruit*.

ECTOCARPUS *longifructus*; tufts large, branching, the divisions feathery; filaments robust, excessively branched, branches mostly opposite, the lesser ones set with short, spine-like, opposite or rarely alternate ramuli; articulations as long as broad; silicules very long, linear-lanceolate, attenuate, densely striate transversely, terminating the principal branches and ramuli.

ECTOCARPUS *longifructus*, *Harv. Man. Ed. 2. p. 61.*

HAB. Parasitical on Algæ between tide-marks. Skail, Orkney, *Mrs. Moffatt*.

DESCR. *Tufts* six or eight inches long, much branched and feathery. *Filaments* robust, not much entangled, excessively divided, the branches and ramuli very generally opposite, sometimes alternate, spreading at wide angles. The smaller branches are furnished with numerous, opposite or alternate, short, spine-like ramuli, and mostly end in the very long silicules which are so striking a feature in this plant. These silicules are very much longer than the branchlet that bears them, and taper from the base to the apex, which is very acute or acuminate: they are closely netted with longitudinal and transverse lines. *Articulations* of the stem and branches about as long as broad, or a little longer. *Colour*, a greenish olive. It closely adheres to paper in drying.

I here figure an *Ectocarpus* from Orkney nearly related to *E. litoralis*, rather than to *E. siliculosus*, and differing chiefly in the greater luxuriance of the frond, and the different form of the fructification. The fructification of our present plant, however, must be regarded more as an exaggeration of that of *E. litoralis* than as essentially different. In *E. litoralis* the apices of the branches grow out beyond the portion converted into fructification, and the latter therefore appears as if it were immersed in

the branch ; here when the ramuli are fertile the whole of the upper portion of the ramulus becomes the fruit. Such a character, if constant, would very well serve for a specific diagnosis, but its constancy has yet to be tested. Our *E. longifructus* rests at present upon a solitary specimen preserved in the herbarium of the Rev. J. H. Pollexfen, of Clapham, to whom I am indebted for my knowledge of this plant, and who has allowed me to abstract one of the lateral branches of his specimen. Persons visiting Orkney would do well to look carefully after the *Ectocarpus*, among which many more forms may yet be noticed. The characters of these plants cannot always be detected by the naked eye, nor are they easily recognisable except when in fructification. I am fully sensible that it is unsafe to propose new species from an inspection of individual specimens, but there are cases in which this course may safely be taken ; and it will be remembered that *Ectocarpus Hincksiæ* is an instance of a species founded, like the present, on a solitary specimen picked up by a lady, but which, in a short time, was ascertained to exist on many distant shores, and which is now well established. I hope the present experiment may be equally successful.

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Fig. 1. ECTOCARPUS LONGIFRUCTUS :—*the natural size*. 2. A branch :—*magnified*. 3. Silicules from the same :—*highly magnified*.

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## PLATE CCLIX.

DELESSERIA SINUOSA, *Lamour*.

GEN. CHAR. *Frond* rose-red, flat, membranaceous, with a percurrent midrib. *Fructification* of two kinds, on distinct individuals; 1, spherical *tubercles* (*coccidia*) immersed in the frond, and containing a globular mass of angular spores; 2, *tetraspores*, forming defined spots in the frond, or in leaf-like processes. DELESSERIA (*Lamour*.),—in honour of *Baron B. Delessert*, a distinguished botanist and patron of Botany.

DELESSERIA *sinuosa*; stem elongated, branched, beset with oblong or obovate, deeply-sinuated or pinnatifid, toothed, transversely-ribbed leaves.

DELESSERIA *sinuosa*, *Lamour. Ess.* p. 124. *Lyng. Hydrop. Dan.* p. 7. t. 2. *Ag. Sp. Alg.* vol. i. p. 174. *Ag. Syst.* p. 248. *Hook. Fl. Scot.* part 2. p. 100. *Grev. Fl. Edin.* p. 292. *Grev. Alg. Brit.* p. 73. *Hook. Br. Fl.* vol. ii. p. 285. *Wyatt, Alg. Damn.* no. 62. *Harv. in Mack. Fl. Hib.* part 3. p. 191. *Harv. Man.* ed. 1. p. 55. *Endl. 3rd Suppl.* p. 53.

WORMSKIOLDIA *sinuosa*, *Spreng. Syst. Veg.* vol. iv. p. 331.

FUCUS *sinuosus*, *Good. and Wood. in Linn. Trans.* vol. iii. *Eng. Bot.* t. 822. *Turn. Syn.* p. 1. *Turn. Hist.* t. 35.

FUCUS *crenatus*, *Gm. Hist. Fuc.* p. 184. t. 24. f. 4. *Linn. Syst. Gm.* p. 1388.

FUCUS *rubens*, *Huds. Fl. Ang.* p. 573. *Lightf. Fl. Scot.* p. 943. *Stack. Ner. Brit.* p. 18. t. 7.

FUCUS *roseus*, *Fl. Dan.* t. 652.

FUCUS *Palmetta*, *varietas, Esper, Ic. Fuc.* vol. i. p. 84. t. 42.

HAB. Parasitical on the stems of *Laminaria digitata*; also attached to various substances in deep water. Perennial. Summer and autumn. Common on the British shores.

GEOGR. DISTR. Atlantic shores of Europe and North America.

DESCR. *Root* a small disc. The frond originates in an oblong or obovate, deeply sinuated, or pinnatifid leaf, four to six inches in length, and from one to four inches in breadth, furnished with a strong, percurrent midrib, pinnated with secondary, opposite nerves, one of which runs to the apex of each lacinia of the frond. As the growth of the plant proceeds, the laciniae become deeper and deeper, and at length the cutting between each reaches the mid-rib; and at the same time the margins of each lacinia become first toothed and then incised, while lesser opposite nervelets are given off to the marginal teeth by their primary nerve. At this stage the midrib of the first-formed leaf has become a stem pinnated with a great number of leaves, of similar form and structure to what the first leaf had been; and at a further period various irregularities of branching, some caused by laceration, some by proliferous growth, take place, till there results a much branched stem, well clothed with pinnatifid leaves. The margin is sometimes slightly toothed, and sometimes cut into very slender processes, or cilia; and not uncommonly, when the plant vegetates at a depth of 6–10 fathoms,



every lacinia is drawn out at the apex into tendrils, and the depauperated lamina very much cut into narrow, jagged processes. *Tubercles* solitary, either seated on the nerves of the leaf, or borne on little leaflets rising from the nerve, depressed, containing a tuft of beaded filaments, finally resolved into spores. *Tetraspores* in oblong or linear marginal sori, formed at the apices of the lateral nerves, often confined to the slender, marginal processes. *Colour*, a beautiful purplish crimson or lake. In drying, the frond adheres to paper.

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Next to *D. sanguinea* (Tab. CLI.) this, when well grown, and of large size, is one of the handsomest of the genus. Our plate represents the frond in rather a young state, a specimen having been chosen for figuring which exhibits the changes that take place in form during the growth of the frond. At first the plant consists of a simple, penninerved leaf sinuated at the margins. The sinuosities gradually deepen into lateral lobes; and these lobes, as is shown in the lower part of the figure, deepen into branches, or new fronds, at first sinuous, then lobed and at length divided like the fronds from which they grow. Thus, eventually, a much branched and leafy frond results from the original leaf, by regular growth and subdivision of the margin. When any vigorous part is wounded, an irregular, proliferous growth likewise takes place, new leaflets springing from any part of the midrib. Sometimes the margin is much laciniated.

*D. sinuosa* is abundant throughout the Northern Atlantic. In the Southern Ocean it is represented by *D. quercifolia* and *D. Lyallii*, two very beautiful species which resemble it closely in form and mode of growth, but which are essentially different.

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Fig. 1. A young and vigorous frond of *DELESSERIA SINUOSA*. 2. Leaf from an old frond, of the cut variety, with sori of tetraspores in the marginal lobes:—*both of the natural size*. 3. Marginal lobe with tubercle. 4. Section of the tubercle. 5. Strings of spores, from the same. 6. Marginal lobe, with sorus, formed out of the apex of the nerve. 7. Tetraspore. 8. Portion of the surface:—*all magnified*.

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## PLATE CCLX.

ELACHISTEA FLACCIDA, *Aresch.*

GEN. CHAR. *Fronde* parasitical, consisting of a dense tuft of free, simple, articulated, olivaceous filaments, rising from a common tubercular base, composed of vertical, branching fibres, closely combined into a cartilaginous mass. *Fructification*, pear-shaped spores attached to the bases of the filaments concealed in the tubercles, and frequently accompanied by paranemata. ELACHISTEA (*Fries*), — from ἐλαχιστα, the *least*; from the small size of these plants.

ELACHISTEA *flaccida*; tufts pencilled: filaments elongate, flaccid, membranaceous, much attenuated to the base; the lower articulations half as long as broad, the upper of equal length and breadth; tubercle hemispherical.

ELACHISTEA *flaccida*, *Aresch.*—*J. Ag. Gen. et Sp. Alg.* vol. i. p. 12. *Harv. Man.* ed. 2. p. 50. *Fr. Fl. Scan.* p. 317. *Eng. Bot.* t. 2912.

ELACHISTEA *breviarticulata*, *Aresch. in Linn.* vol. xvi. p. 234. t. 8. f. 5.

PHYCOPHILA *flaccida*, *Kütz. Phyc. Gen.* p. 330.

MYRIONEMA *breviarticulatum*, *Endl. 3rd Suppl.* p. 23.

CONFERVA *flaccida*, *Dillw. t. G.* *Harv. in Hook. Br. Fl.* vol. ii. p. 355. *Harv. in Mack. Fl. Hib.* part 3. p. 227. *Harv. Man.* ed. 1. p. 132. *Wyatt, Alg. Damn.* no. 292.

CONFERVA *obtusa*, *Ag. Syst.* p. 101.

CONFERVA *breviarticulata*, *Suhr, in Flora* 1831, p. 32. t. 4. f. 36, *x, y, z.*

HAB. Parasitical on *Cystoseira fibrosa*, common. Annual. Summer and autumn.

GEOGR. DISTR. Atlantic coasts of France and England.

DESCR. *Tubercle* small, one to three lines in diameter, hemispherical, very firm, composed of moniliform, dichotomous fibres densely compacted together, and not easily separable. From the tips of the fibres composing the tubercle spring the filaments, which are half an inch long, or something more, tapering extremely at the base, then rapidly widening to the middle, from which they taper very gradually to the upper extremity. *Articulations* in the lower and middle parts of the filament not quite half as long as broad, in the upper part as long as, or rather longer than, their breadth; the apex obtuse. Between the filaments spring numerous linear clavate paranemata, tapering to the base, and gradually swelling upwards; these have oval articulations, about thrice as long as broad. *Spores* lodged among the paranemata, obovate, on slender, short pedicels, dark olive. *Substance* flaccid and soft, readily adhering to paper in drying. *Colour* a pale greenish olive, sometimes yellowish or foxy.



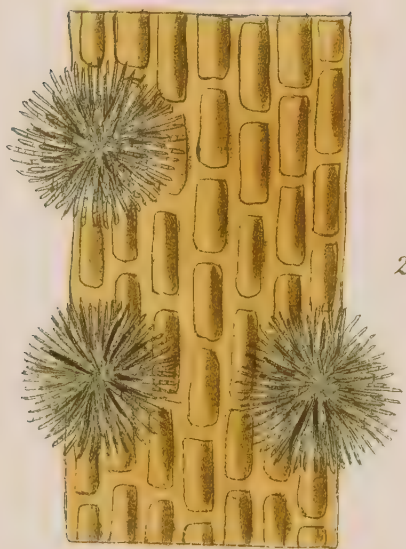
A very common parasite on *Cystoseira fibrosa*, whose branches are rarely found free from the olive-coloured soft pencils of this little plant. In size and appearance to the naked eye there is much resemblance to *Elachistea fucicola* (Tab. CCXL.), except that the colour is generally greener, and the length of the tufts rather less; but under the microscope these species are very readily known from one another. *E. flaccida* is remarkable for the shortness of its articulations, in proportion to their breadth throughout the lower and middle portions of the filaments, and for the gradually increasing length of the cells towards the apices. The filaments, also, taper exceedingly at the base; and the tubercle from which they originate is of very much smaller size than in *E. fucicola*.

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Fig. 1. Tufts of ELACHISTEA FLACCIDA growing on *Cystoseira fibrosa*. 2. Vertical section of part of a frond, showing a portion of the tubercle, with paranemata and spores, and part of two filaments. 3. Apex of a filament. 4. Spore, with its paranemata :—*all magnified*.

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## PLATE CCLXI.

ELACHISTEA STELLULATA, *Griff.*

GEN. CHAR. *Fronde* parasitical, consisting of a dense tuft of free, simple, articulated, olivaceous filaments, rising from a common tubercular base, composed of vertical, branching fibres, closely combined into a cartilaginous mass. *Fructification*, pear-shaped spores attached to the bases of the filaments concealed in the tubercle, and frequently accompanied by paranemata. ELACHISTEA (*Fries*), — from ἐλαχιστα, the *least*; from the small size of these plants.

ELACHISTEA *stellulata*; tufts very minute, stellate; tubercle composed of large cells; filaments short, tapering to the base, linear club-shaped, obtuse; articulations about twice as long as broad, uniform; paranemata with short articulations.

ELACHISTEA *stellulata*, *Griff. MSS. Aresch. Pug. in Linn. vol. xvii. p. 261. tab. 9. f. 4. Harv. Man. ed. 2. p. 51.*

MYRIONEMA *stellulatum*, *J. Ag. et Gen. Sp. Alg. vol. i. p. 49.*

CONFERVA *stellulata*, *Harv. Man. ed. 1. p. 132.*

HAB. Parasitical on *Dictyota dichotoma*. Annual. Summer. Torquay, *Mrs. Griffiths*.

GEOGR. DISTR. Not observed out of England.

DESCR. *Tufts* exceedingly minute, scarcely half a line in diameter, appearing like dark brown specks, dotting over the surface of the *Dictyota*, and under the microscope resembling miniature *echini*. *Tubercle* well developed, composed of dichotomous strings of large, colourless cells. From the terminal cell of each string the filaments and paranemata arise. *Filaments* a quarter of a line in length, linear-clavate, gradually tapering from the obtuse apex to the base the articulations of nearly uniform size, all being from once and a half to twice as long as broad, constricted at the joints. Each articulation contains a bag of rather dark coloured endochrome. *Paranemata* very numerous, springing with the filaments, and about one-third as long, with very short articulations, club-shaped. *Spores* unknown to me. They are figured by Dr. Areschoug as obovate-oblong.

This minute and microscopically beautiful little plant was discovered some years ago by Mrs. Griffiths on the old fronds of *Dictyota dichotoma*, and first described in the first edition of the Manual of British Algæ. I have not seen any other specimens than those originally collected by Mrs. Griffiths, who met with the parasite infesting several specimens of the *Dictyota*; nor am I aware that any other observer has noticed it in Britain, or that

it has been detected elsewhere. The Alga on which it grows is so very widely scattered that our *Elachistea* ought, probably, to have a place in many distant floras, but its minute size has hitherto been its protection. It looks so much like the fructification of the *Dictyota*, when carelessly examined with the naked eye, or with a lens of small power, that it may often be passed over as such ; and I was once disposed to think that it might be merely a diseased proliferous state of that fructification. This opinion I have long abandoned, and recognised this production as a parasite, and true member of the genus *Elachistea*. In this latter point, however, I am at issue with my friend Professor J. Agardh, who places *E. stellulata* in the genus *Myriomena*. As far as size and outward characters go, such a position seems natural, but it will be found on closer inspection, that the filaments here are of two kinds, exactly as in *Elachistea*, and that they spring not from decumbent, adnate filaments, as in *Myriomena*, but from erect, radiating ones, compacted into a little tubercle.

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Fig. 1. Part of a frond of *Dictyota dichotoma*, infested with the ELACHISTEA :—  
of the natural size. 2. Some of the tufts on a portion of the membrane :—  
magnified. 3. Vertical section of a part of tuft, most of the filaments  
removed :—highly magnified.

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## PLATE CCLXII.

CALLITHAMNION BYSSOIDEUM, *Arn.*

GEN. CHAR. *Frond* rosy, or brownish-red, filamentous; stem either opaque and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds on distinct plants; 1, external *tetraspores*, scattered along the ultimate branches, or borne on little pedicels; 2, roundish or lobed, berry-like receptacles (*favellæ*), seated on the main branches, and containing numerous, angular spores. CALLITHAMNION (*Lyngb.*),—from *καλλος*, *beauty*, and *θαμνιον*, a *little shrub*.

CALLITHAMNION *byssoides*; stems exceedingly slender, flaccid, and byssoid, much divided; branches lanceolate in outline, virgate, set with numerous long, slender, flexuous, pinnate or subbipinnate plumules; articulations of the branches eight times, of the ramuli four times as long as broad; tetraspores, one or two, sessile on the pinnules, elliptical; favellæ binate, subterminal.

CALLITHAMNION *byssoides*, *Arn. MSS. Harv. in Hook. Br. Fl.* vol. ii. p. 342. *Wyatt, Alg. Damn.* no. 185. *Harv. Man.* ed. 1. p. 107.

HAB. On several Algæ, in tide-pools near low-water mark; on *Codium tomentosum*, especially. Annual. Summer. Whitsand Bay, *Dr. Jacob*. Devonshire, *Mrs. Griffiths*. Salcombe, *Mrs. Wyatt*. Plymouth, *Rev. W. Hore and Dr. Cocks*. Portaferry, Strangford Lough, *Mr. W. Thompson*. Dublin Bay, and Cork Harbour, *W. H. H.* Not an uncommon species.

GEOGR. DISTR. Not noticed out of Britain.

DESCR. *Filaments* extremely slender, as fine as cobwebs, densely tufted, from two to four inches long, excessively branched in a decompound-pinnate manner, all the divisions alternate and distichous. The whole frond, when displayed on paper, has an ovate or pyramidal outline, the lowermost branches being longer than the upper ones; each individual branch is narrow-lanceolate, when taken in connection with the plumules with which it is clothed. These plumules are slender, and flexuous, simply or doubly pinnated, laxly set, with few and distant pinnules; the latter very long, and destitute of ramuli or lateral processes. *Articulations* of the stem and branches of great length, 6–8 times longer than broad, destitute of internal veins, except in the lower part of the stem; articulations of the ramuli at least four times as long as broad, but often more. *Tetraspores* elliptical, sessile, rather large, borne on the sides of the pinnules, towards the base, one or two, rarely more, on each pinnule. *Favellæ* binate, generally terminating truncated branches. *Colour*, a fine rosy lake, with a slightly purple or sometimes brown hue. *Substance* exceedingly tender and gelatinous, closely adhering to paper in drying.



This species was first collected, it would seem, by Dr. Jacob at Whitsand bay, and first recognised as new by Professor Walker Arnott, from whom I first received specimens under this name,—a name adopted in the British Flora, and now generally recognised. *E. byssoideum* is one of the softest and most gelatinous of the genus, having exceedingly slender fronds, growing in dense tufts. To the naked eye it frequently bears much resemblance to *C. corymbosum*, so much that it sometimes requires a microscope to determine to which species the specimen under examination may belong. The ultimate branching, and the position of the tetraspores will then afford an easily seen character, by which the two plants may be distinguished. There is a much closer affinity, indeed, between *C. byssoideum* and *C. roseum*, than between the former and *C. corymbosum*. From *C. roseum* our plant is chiefly known by its much greater delicacy and softer substance, and its adhering much more closely to paper, and being more glossy when dry.

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Fig. 1. *CALLITHAMNION BYSSOIDEUM*; a tuft:—*of the natural size*. 2. Part of branch, with bipinnate plumule. 3. Pinnules, bearing tetraspores from the same. 4. Part of a branch with favellæ. 5. A favella. 6. Articulations from the lower part of the stem:—*all more or less highly magnified*.

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## PLATE CCLXIII.

ENTEROMORPHA HOPKIRKII, *M'Calla*.

GEN. CHAR. *Frond* tubular, membranaceous, of a green colour, and reticulated structure. *Fructification*; granules, commonly in fours, contained in the cellules of the frond. ENTEROMORPHA (*Linn.*),—from *εντερον*, an *entail*, and *μορφη*, *form* or *appearance*.

ENTEROMORPHA *Hopkirkii*; frond excessively slender and byssoid, flaccid, very much branched; branches feathery, decompose, erect, attenuated, set with minute, subulate ramuli; cellules large, hyaline, each cell containing one or two minute grains of endochrome; the ramuli composed of a single series of such cellules.

ENTEROMORPHA *Hopkirkii*, *M'Calla*, *Alg. Hib. ined.* *Harv. in Phyc. Brit.* vol. i. pl. XV. *Harv. Man. ed. 2. p.* .

HAB. Dredged in 4–10 fathoms water. Annual. Summer and autumn. Goodrington, Torbay, *Mrs. Griffiths* (1838). Carrickfergus, *Mr. M'Calla* (1845).

GEOGR. DISTR. — ?

DESCR. *Fronds* six to twelve inches long or more, of exceedingly fineness and delicacy, the main stems being scarcely the diameter of human hair, the branches and ramuli very much more slender; excessively branched and feathery, the branches erect, straight, alternate, or rarely opposite, tapering to a fine point, repeatedly decompose, the ultimate divisions set with minute, awl-shaped ramuli. The structure of the frond is peculiarly lax. The cells in the branches are of large size, about three or four visible in the breadth of the branch, hyaline, containing generally a single small grain of grass-green endochrome or *chlorophyll*. The ultimate ramuli consist of a single series or string of such cells, or, in other words, are articulated. There is much less difference between the diameter of the larger and smaller branches in this species than in most others of the genus. *Colour* a pale yellowish green, becoming paler in drying. *Substance* exceedingly flaccid and tender, most closely adhering to paper in drying.

I am not prepared to defend the *characters* of all the species of the genus *Enteromorpha*; but among our British kinds the present one is remarkable for having some points easily recognisable, and for being a plant of much delicacy and beauty. It rivals in the tenuity of its fronds, and in their bushy branching, the most delicate of the *Cladophoræ*, having, to the naked eye, an aspect not very unlike that of *C. Rudolphiana*, and being more slender than *C. gracilis*. Under the microscope it is known by the very



large size of its nearly empty cells, in the centre of which a small spherical grain of emerald-green endochrome is found. The ramuli are so slender that they consist of a single row of such cells, and thus have something the character of the threads of a *Conferva*.

My first knowledge of this species was from specimens dredged in 1838 by Mrs. Griffiths in Torbay. They remained in my Herbarium unnamed until the plant was again found, in 1845, by the late Mr. M'Calla, who bestowed the name as a tribute of grateful respect to Mr. Thomas Hopkirk, author of "*Flora Glottiana*," from whom he had received kindness whilst resident in the neighbourhood of Belfast. In now adopting Mr. M'Calla's specific name I wish to record the regret I feel, in common with all naturalists acquainted with his merits, that death should so soon have closed a career which opened with much promise of future fame. The readers of the *Phycologia* must be well acquainted with the name of Mr. William M'Calla, in connection with the habitats of many of our rarest Algæ. It is therefore almost superfluous to say that he was well acquainted with the species, and had a most acute eye to detect a minute species, and a most accurate judgment to discriminate one varying form from another. But though Algæ were the natural objects in which, of late, he chiefly delighted, he had a very extensive knowledge of marine zoology, and has made large additions to the Irish Faunæ. Born in very humble circumstances, imperfectly educated, and always with narrow means, he had to struggle through life with many hindrances to progress. That he overcame many of those hindrances is a proof of his talents and energy; that he did not overcome all may well be forgotten by those who have not had to struggle with any, and yet feel disposed to criticise the short-comings of others. Mr. M'Calla fell a victim to Cholera, in May 1849, aged about 35.

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Fig. 1. *ENTEROMORPHA HOPKIRKII*:—*of the natural size*. 2. Portion of a branch:—*magnified*. 3. Small fragment of the same, with its subulati ramuli:—*very highly magnified*.

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## PLATE CCLXIV.

RHODOMELA SUBFUSCA, *Ag.*

GEN. CHAR. *Frond* filiform, solid, much branched, inarticulate, reticulated; the axis composed of concentric layers of oblong, hyaline cells; the periphery of several rows of minute, irregular, coloured cellules. *Fructification*, 1, ovate capsules (*ceramidia*), containing a tuft of pear-shaped spores; 2, *tetraspores* immersed in swollen ramuli, or contained in proper pod-like receptacles (*stichidia*) in a single or double row. RHODOMELA (*Ag.*),—from *ῥοδεος*, *red*, and *μελας*, *black*; because the species usually become darker in drying.

RHODOMELA *subfusca*; frond filiform, much branched; the branches irregularly divided, clothed with pinnated branchlets, and subulate, simple scattered or fasciculate ramuli; pinnules subulate; tetraspores contained either in the somewhat swollen ultimate ramuli (in summer), or in proper branching stichidia (produced in winter).

RHODOMELA *subfusca*. *Ag. Sp. Alg.* vol. i. p. 378. *Ag. Syst.* p. 199. *Spreng. Syst. Veg.* vol. iv. p. 343. *Grev. Alg. Brit.* p. 193. *Hook. Br. Fl.* vol. ii. p. 294. *Wyatt, Alg. Damn.* no. 111. *Harv. in Mack. Fl. Hib.* part 3. p. 197. *Harv. Man.* ed. 2. p. 79. *Endl. 3rd Suppl.* p. 47.

LOPHURA *cymosa*, *Kütz. Phyc. Gen.* p. 435.

GIGARTINA *subfusca*, *Lamour. Ess.* p. 48. *Lyngb. Hyd. Dan.* p. 47. t. 10. *Grev. Fl. Edin.* p. 289.

SPHÆROCOCCUS *subfuscus*, *Hook. Fl. Scot.* part 2. p. 104.

FUCUS *subfuscus*, *Woodw. in Linn. Trans.* vol. i. p. 131. t. 12. *Good. and Woodw. Linn. Trans.* vol. iii. p. 212. *Turn. Syn. Fuc.* p. 350. *Turn. Hist.* t. 10. *E. Bot.* t. 1164. *Esper, Ic. Fuc.* vol. ii. p. 11. t. 117.

FUCUS *confervoides*, *Huds. Fl. Ang.* p. 591.

FUCUS *variabilis*, *Good. and Woodw. Linn. Trans.* vol. iii. p. 220.

FUCUS *setaceus*, *Wulf. Crypt. Aquat.* no. 40.

HAB. On rocks and shells, in pools between tide marks; sometimes on the larger Algæ. Biennial or perennial. Spring and summer. Generally dispersed round the coast.

GEOGR. DISTR. Atlantic shores of Europe and North America.

DESCR. *Root* a small thin disc. *Fronds* generally tufted, from three to twelve inches in length, varying greatly in diameter, sometimes not thicker than hogs' bristle, sometimes twice or four times as thick, tapering upwards, cylindrical, much branched. *Branches* long and virgate, sometimes undivided, sometimes forked, mostly alternate, imperfectly distichous, or spirally placed, well furnished, in summer, with alternate lateral secondary branches. These secondary branches are sometimes long, and repeatedly pinnate, sometimes short and simply pinnate; sometimes they are absent altogether, and their place supplied by numerous, scattered or clustered, awl-shaped, simple ramuli. These ramuli are rarely absent on the lower parts of the branches

and stem. In winter all the secondary branches fall off, leaving merely the main branches, to which the stumps of the fallen ramuli adhere, and give them a singularly uncouth aspect. In spring the frond pushes out a new series of more slender and decompound ramuli than it had borne the first season. The whole frond is perfectly opaque, without any appearance of articulation. *Capsules* ovate, sessile, or on very short peduncles, borne on the pinnules in summer. *Tetraspores* produced both in summer and winter; in summer immersed in the apices of the pinnules, which are then slightly distorted; in winter contained in special receptacles, or *stichidia*, which spring from the sides of the main branches. These stichidia are raised on slender peduncles, forked, and tufted. *Colour* a brownish red, becoming very dark in drying. *Substance* cartilaginous, very rigid in the branches, more flaccid in the ramuli, long resisting the action of fresh water.



This plant is so different in appearance when collected in summer and in winter that it may well be taken by the young botanist for two. The summer specimens are well clothed with slender, multifid and soft ramuli, which lengthen as the season advances, and drop off before winter, leaving bare stems rough with broken stumps.

The *tetraspores* are found either in summer or in winter. At the former season they are simply immersed in the terminal ramuli; at the latter they will be found lodged in small branching *stichidia* scattered irregularly along the sides of the branches.

Except in its much more bushy and branching habit and paler colour, there is a very close resemblance between this species and *R. lycopodioides* (Tab. L.)

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Fig. 1. RHODOMELA SUBFUSCA:—*of the natural size.* 2. Pinnated (summer) branchlet with tetraspores in the pinnules. 3. Tufted stichidia (winter) with tetraspores. 4. A tetraspore. 5. Branchlet with capsules. 6. A capsule or ceramidium. 7. Transverse section of the stem:—*all more or less highly magnified.*

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## PLATE CCLXV.

CYSTOSEIRA ERICOIDES, *Ag.*

GEN. CHAR. *Fronde* much branched, occasionally leafy at the base; *branches* becoming more slender upwards, and containing strings of simple air-vessels within their substance. *Receptacles* terminal, small, cellular, pierced by numerous pores, which communicate with immersed, spherical *conceptacles*, containing parietal *spores* and tufted *antheridia*. CYSTOSEIRA (*Ag.*),—from *κυστις*, a bladder, and *σειρα*, a chain; because the air vessels are often arranged in strings.

CYSTOSEIRA *ericoides*; stem thick, woody, short, cylindrical, beset with numerous, slender, filiform branches, variously divided, and densely clothed with small, spine-like, awl-shaped ramuli; air-vessels small, solitary beneath the apices of the branches; receptacles cylindrical, armed with awl-shaped processes.

CYSTOSEIRA *ericoides*, *Ag. Sp. Alg.* vol. i. p. 52. *Ag. Syst.* p. 281. *Spreng. Syst. Veg.* vol. iv. p. 316. *Grev. Alg. Brit.* p. 4. *Hook. Br. Fl.* vol. ii. p. 265. *Harv. in Mack. Fl. Hib.* part 3. p. 167. *Harv. Man.* p. 18. *Endl. 3rd Suppl.* p. 30. *J. Ag. Gen. et Sp. Alg.* vol. i. p. 221.

HALERICA *ericoides*, *Kütz. Phyc.* p. 354.

FUCUS *ericoides*, *Sp. pl.* p. 1631. *Good. and Wood. in Linn. Trans.* vol. iii. p. 130. *E. Bot.* t. 1968. *Turn. Hist.* t. 191.

FUCUS *tamariscifolius*, *Huds. Fl. Ang.* p. 576. *Stack. Ner. Brit.* p. 44. t. 11. *Turn. Syn. Fuc.* p. 88. (*excl. syn. Gmel.*)

FUCUS *selaginoides*, *Esper, Ic. Fuc.* vol. i. p. 69. t. 31. (*excl. syn. Gmel.*) *Good. and Wood. Linn. Trans.* vol. iii. p. 132. *Turn. Syn.* p. 85.

HAB. On marine rocks, near low-water mark and in tide-pools. Perennial. Summer and autumn. Frequent on the shores of the south of England and south and west of Ireland. Yarmouth Reach, *Mr. Turner*. Port Rush, Antrim, *Mrs. Ovens*.

GEOGR. DISTR. On the Atlantic shores of Europe and the north of Africa.

DESCR. *Root* a large conical or flattened disc. *Fronde* generally solitary, twelve to eighteen inches in length, rising with a cylindrical stem nearly half an inch in diameter. This stem is four to six inches long, and either simple or forked, or having four or five main divisions, which support numerous slender, crowded, bitripinnated branches. *Branches* as thin as whip-cord, decompose, all the divisions alternate and distichous, densely set with short, spine-like ramuli or leaves, each of which has a gland-like pore on its back, near the base. *Air vessels* few and small, oblong, placed usually in the terminal branchlets just below the base of the receptacle. *Receptacles* formed in the apices of all the branches, oblong, cylindrical, becoming nodose, always armed with spine-like ramuli, similar to those that clothe the branches. *Spores* obovate, with wide borders. When growing, under water, the frond reflects beautiful prismatic colours, which are lost when it is lifted into the air:—the colour is then a yellowish olive. On being dried the frond turns black, and shrinks considerably. *Substance* tough and leathery.

This is one of the most beautiful of the British species of *Cystoseira*, especially when seen growing under water. It then appears clothed with the richest tints of blue and green, more like those phosphorescent gleams that flash from the lower marine animals than any vegetable colours. As each twig waves to and fro in the water the hues vary, and sometimes, when the light falls partially on a branch, some portions seem covered with sky-blue flowers, while others remain dark. All these beautiful tints perish when the plant is removed from the water. The specific name *ericoides*, or heath-like, alludes both to the brilliant colouring and the shrubby character of the frond, which is covered with small ramuli resembling the leaves of a heath.

*C. ericoides* is common on the southern shores of our islands, and becomes gradually less frequent towards the north. It has been once found on the coast of Ayrshire by the Rev. D. Landsborough.

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Fig. 1. *CYSTOSEIRA ERICOIDES* :—*of the natural size*. 2. Receptacle and vesicle, both formed in the apex of a branch. 3. Section of a conceptacle, showing the spores and antheridia. 4. A spore :—*all more or less magnified*.

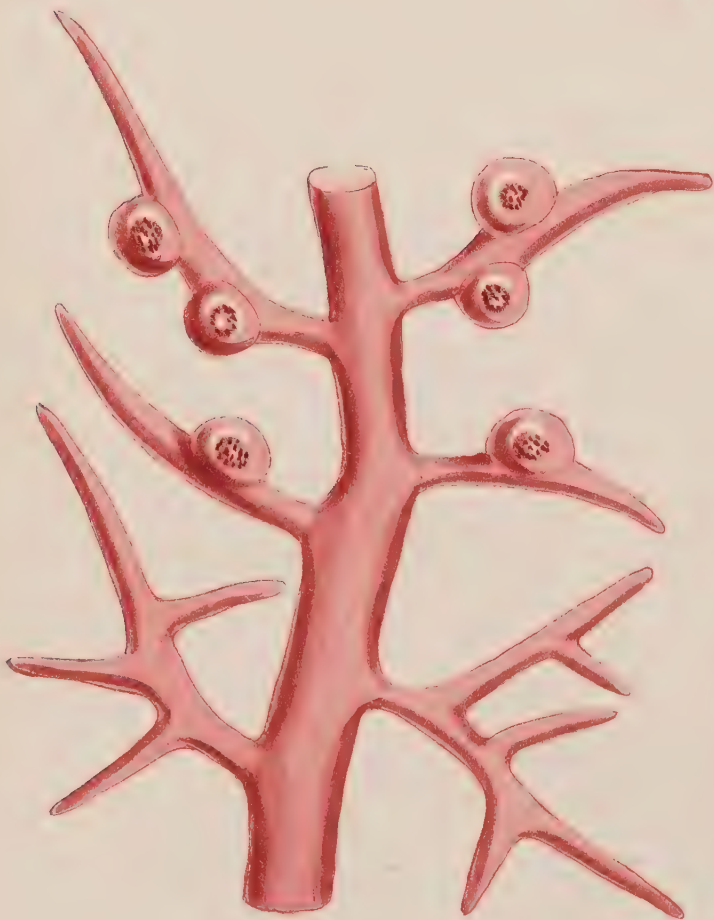
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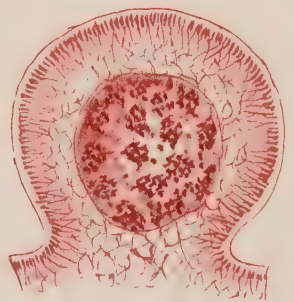




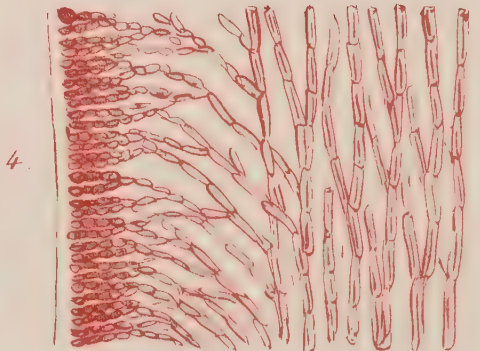
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2.



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4.



## PLATE CCLXVI.

GIGARTINA TEEDII, *Lamour*.

GEN. CHAR. *Frond* cartilaginous, either filiform compressed or flat, irregularly divided, purplish-red; the axis or central substance composed of branching anastomosing longitudinal fibres; the periphery of dichotomous filaments, laxly set in pellucid jelly; their apices moniliform, strongly united together. *Fructification* double, on distinct plants; 1, external *tubercles*, containing, on a central placenta, dense clusters of *spores*, scattered among the filaments of the periphery. GIGARTINA (*Lamour*.),—from γυαρον, a *grape stone*, which the tubercles resemble.

GIGARTINA *Teedii*; frond cartilagineo-membranaceous, flaccid, flat, linear, acuminate, repeatedly pinnate; the pinnæ opposite or alternate, horizontally patent, distichous, set with horizontal, spine-like ramuli; coccidia globose, on the ramuli, sessile.

GIGARTINA *Teedii*, *Lamour. Ess.* p. 49. t. 4. f. 11. *Hook. Br. Fl.* vol. ii. p. 301. *Wyatt, Alg. Damn.* no. 27. *Harv. Man.* ed. 1. p. 76. *Endl. 3rd Suppl.* p. 42.

CHONDRACANTHUS *Teedii*, *Kütz. Phyc.* p. 399.

RHODOMENIA *Teedii*, *Grev. Alg. Brit.* p. 96.

SPHÆROCOCCLUS *Teedii*, *Ag. Sp. Alg.* vol. i. p. 277. *Ag. Syst. Alg.* p. 225. *Grev. Crypt. Fl.* t. 356.

FUCUS *Teedii*, *Roth, Cat. Bot.* vol. iii. p. 108. t. 4. *Turn. Hist. Fuc.* t. 208.

HAB. On rocks, at the extreme limit of low water. Perennial. Very rare. Elberry Cove, Torbay, *Mrs. Griffiths* (1811).

GEOGR. DISTR. Atlantic coasts of France, Spain, and Portugal. Abundant in the Mediterranean.

DESCR. *Root* a flattened disc. *Fronds* numerous from the same base, densely tufted, from three to six inches long, distichous, excessively branched in a more or less regularly pinnate manner, all the divisions horizontally patent. The main stems are from one to two, or, in very luxuriant specimens, three or four lines in breadth in the middle, and taper towards both ends, being attenuated upwards into a long slender point. They are either simple or forked, or irregularly cloven, flexuous, and closely beset with lateral branches which are simply, doubly, or trebly pinnate, and always beset with short, spine-like, horizontally patent ramuli. Different specimens vary much in the amount of branching, and in the breadth of the frond. *Fructification* has not been found in this country. The favellidia are enclosed in tubercles as large as poppy seed, plentifully scattered over the sides of the ramuli, and partially immersed in them. *Colour*, when quite recent, a dull brownish red; but in fresh water and in decay the frond assumes various tints of red and yellow, and finally becomes verdigris green. *Substance* between cartilaginous and membranaceous, soft and flexible, becoming rather horny when dry. In drying the frond shrinks considerably, and scarcely adheres to paper.



This is one of the rarest and most interesting of the British Sea-weeds. It was first found in England by Mrs. Griffiths, in the year 1811, on a small rock in Elberry Cove, growing in scattered tufts on spots left bare at the extreme limit of low water, of spring tides ; and on this rock it continues to grow, and may generally be found in greater or less perfection every summer. In warm summers the plants are larger, more branching, and with broader membranes, and the tufts more numerous. Fructification has never been observed in this locality, and perhaps this is the cause why the plant appears never to have extended itself. On the opposite coast of Normandy, and southwards along the French coast, it is much more abundant, annually producing fruit ; and in the Mediterranean *G. Teedii* is a very common plant. With us it seems to have reached nearly its extreme northern limit.

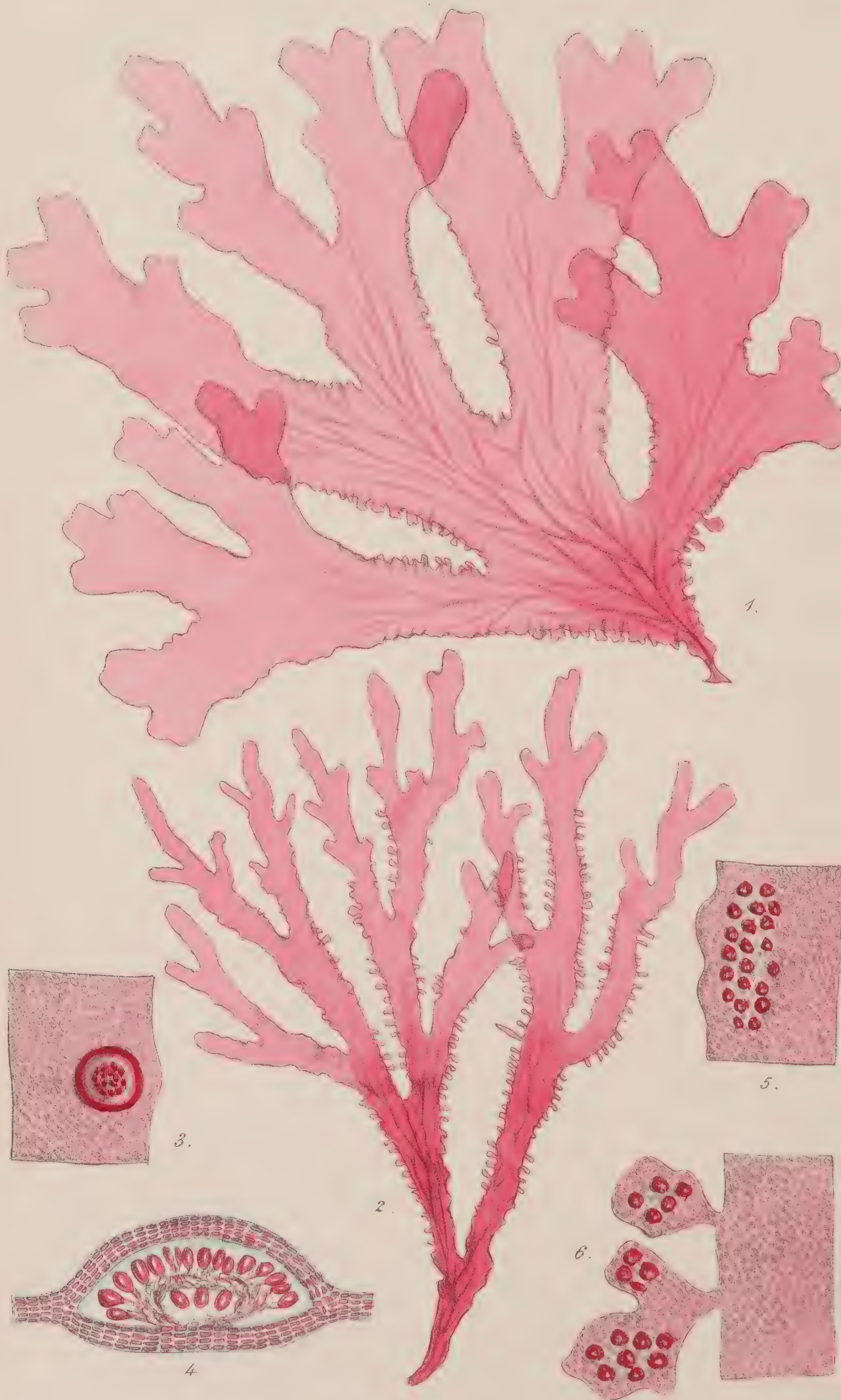
This plant is closely allied to *G. Chamiseoi*, of Peru, and *G. Chauvini*, of extra-tropical South America, from some varieties of which it is not always easy to separate it. In Britain it may be confounded with some states of *Gelidium corneum* ; but the substance is much softer, and the structure, as seen in thin slices placed under a microscope, extremely different.

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Fig. 1. GIGARTINA TEEDII :—*of the natural size.* 2. Part of a fertile frond (from a foreign specimen) with tubercles in the ramuli. 3. Section of a tubercle. 4. Longitudinal section of the frond :—*all magnified in a greater or less degree.*

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## PLATE CCLXVII.

NITOPHYLLUM LACERATUM, *Grev.*

GEN. CHAR. *Frond* membranaceous, reticulated, rose-red (rarely purplish), irregularly cleft, veinless, or furnished with irregular veins towards the base. *Fructification* two-fold, on distinct plants; 1, convex *tubercles* (*coccidia*) immersed in the frond, and containing a mass of spores; 2, *tetraspores* grouped into definite *sori*, or spots variously scattered over the frond. NITOPHYLLUM (*Grev.*), corruptly formed from *nitor*, *brilliancy*, and φύλλον, a *leaf*.

NITOPHYLLUM *laceratum*; frond sessile or shortly stipitate, much branched dichotomously, traversed by numerous branching and anastomosing nerves; segments linear, variously cleft and lobed, waved at the margin, obtuse; spots of tetraspores oblong, either marginal or borne on distinct, leafy processes of the margin.

NITOPHYLLUM *laceratum*, *Grev. Alg. Brit.* p. 83. *Hook. Brit. Fl.* vol. ii. p. 288. *Wyatt, Alg. Danm.* No. 107. *Harv. in Mack. Fl. Hib.* part 3. *Harv. Man. Ed.* 1. p. 59.

CRYPTOPLEURA *lacerata*, *Kütz. Phyc. Gen.* t. 68. vol. iii. p. 444. *Sp. Alg.* p. 870.

AGLAIOPHYLLUM *laceratum*, *Mont. Fl. Canar.* p. 150. *Endl. 3rd Suppl.* p. 52.

DELESSERIA *lacerata*, *Ag. Sp. Alg.* vol. i. p. 184. *Ag. Syst.* p. 251. *Grev. Fl. Edin.* p. 293.

WORMSKIOLDIA *lacera*, *Spreng. Syst. Veg.* vol. iv. p. 332.

CHONDRUS *laceratus*, *Lyngh. Hyd. Dan.* p. 18.

FUCUS *laceratus*, *Gmel. Hist.* p. 179. t. 21. f. 4. *Good and Woodw. Linn. Trans.* vol. iii. p. 155. *Stack. Ner. Brit.* p. 77. t. 13. *Turn. Syn.* p. 154. *Turn. Hist.* t. 68. *E. Bot.* t. 1067.

FUCUS *crispatus*, *Huds. Fl. Alg.* p. 58. *Linn. Syst. Nat.* p. 1718. *Esper, Ic. Fuc.* vol. i. p. 130. t. 90.

FUCUS *endiviæfolius*, *Lightf. Fl. Scot.* p. 948. t. 32.

HAB. On rocks and on the stems of *Laminaria digitata*, near low-water mark and at a greater depth. Annual. Summer. Common on the shores of the British Islands.

GEOGR. DISTR. Atlantic Coasts of Europe and North America.

DESCR. *Root* a small disc, often throwing out creeping fibres. *Fronds* sessile, or with a very short, cartilaginous stem, much divided, four to six or eight inches in length, and as much in expansion, the laciniae varying in breadth from a quarter of an inch to upwards of an inch. The division of the frond is usually dichotomous, with many irregularities; the laciniae are linear, or somewhat cuneiform, lobed and dentate, and often curled at the margin, very obtuse, simple or repeatedly forked. The lower part of the membrane is always traversed by slender, branching and anastomosing, tolerably distinct veins, which in some specimens extend and ramify through the upper

part of the frond also: these are rarely indistinct, and are often very well defined. The axils are patent, the apices spreading widely. A variety is common in which the lateral smaller lobes of the frond hook backwards and coil round any neighbouring plant. *Coccidia* depressed, spheroidal, generally marginal or in marginal processes, containing, on a central placenta, numerous chained spores. *Spots* of tetraspores minute, oblong, confined to a line immediately within the margin, or else placed in little leafy processes which fringe the principal laciniae of the frond. *Substance* delicately membranaceous, and very thin, but somewhat tough, elastic, and not adhering strongly to paper. *Colour* a purplish or brownish full red, reflecting glaucous tints when growing.

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This is the most generally dispersed species of *Nitophyllum*, and the one most usually met with within tide marks. It frequently is found fringing the steep and shaded sides of deep rocky pools, when protected from the sun by overhanging *Fuci*; but its favourite place of growth seems to be on the stems of the larger oar-weeds. The frond varies much in breadth in different specimens, as may be seen by our figure, which, however, by no means represents the extreme forms. Some specimens are so broad and so little divided that they closely approach *N. Gmelini* in aspect, especially when dried; but the substance and colour of the two plants are essentially different, and when seen growing it is impossible to mistake one for the other. A very singular variety of *N. laceratum* is frequently seen between tidemarks, attaching itself by hooked lobes to neighbouring small algæ, and sometimes so intricately interwoven with their stems that it cannot be extricated without tearing. In this the frond is very narrow, of a brighter colour than usual, and almost every lobe converted into a strong recurved hook.

I have frequently observed spores to be developed within the substance of the placenta, as well as on its outer surface. Our figure (fig. 4) represents them in both positions, as seen in a vertical section of the conceptacle.

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Fig. 1. *NITOPHYLLUM LACERATUM*; a broad variety. 2. A narrow variety, with marginal processes:—*both of the natural size*. 3. Small portion of the membrane with a marginal coccidium. 4. Section of the coccidium. 5. Marginal spot of tetraspores. 6. Marginal processes containing spots of tetraspores:—*all magnified*.

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2

## PLATE CCLXVIII.

CONFERVA BANGIOIDES, *Harv.*

GEN. CHAR. *Filaments* green, jointed, attached or floating, unbranched. *Fruit*, aggregated granules, or zoospores, contained in the articulations, having, at some period, a proper ciliary motion.—CONFERVA (*Plin.*), from *conferruminare*, to consolidate; because some of the species were used by the ancients in cases of fractured bones.

CONFERVA *bangioides*; filaments attached, elongated, very slender, soft and lubricous, wavy; articulations about twice as long as broad, containing, at maturity, a compact dark green mass; dissepiments broad, pellucid.

CONFERVA *bangioides*, *Harv. Man. Ed. 1. p. 131. Ed. 2. p.*

HORMOTRICHUM *bangioides*, *Kütz. Sp. Alg. p. 383.*

APLONEMA *bangioides*, *Hass. Fr. Alg. p. 224.*

HAB. On rocks, &c., near low-water mark. Breakwater at Plymouth, *Mr. Blatch*. Torquay, *Mrs. Griffiths*. Port Ballantrae, *Mr. Moore*. Ballycotton, *Miss Ball*.

GEOGR. DISTR. Not noticed out of Britain.

DESCR. *Filaments* from three to six inches in length, capillary, densely tufted, or spreading in large patches, which are dark green and glossy to the eye. Each filament is of equal diameter throughout, but there is much difference between the relative diameters of filaments from the same tuft. The articulations are about twice as long as broad, slightly contracted at the dissepiments, and filled with a dense herbaceous green endochrome, leaving a pellucid border all round. In an advanced stage of growth the endochrome contracts and condenses into a dark-coloured, oblong *spore*, which remains in the centre of the articulation, until, on the breaking up of a plant, it is liberated. *Substance* lubricous, closely adhering to paper in drying.

The species here figured is, in many respects, similar to *C. Youngana*, but is a larger species. From most others it may be known by its very lubricous and glossy tufts and soft feel. Except in colour there is much outward resemblance to *Bangia fuscopurpurea*, though under the microscope no two plants need be more unlike. When the plant first makes its appearance the colouring substance nearly fills the cell, and is of a pale colour, but gradually it condenses into a small, subcylindrical and dark-coloured spore in the centre.

The first specimens I received of this plant were sent to me by Mrs. Griffiths, to whom belongs the merit of having determined its characters correctly. It has subsequently been found in two stations in Ireland, but must still be regarded as one of our rarer species.

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Fig. 1. Tuft of CONFERVA BANGIODES :—*the natural size*. 2. Portions of filaments of different ages :—*highly magnified*.

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## PLATE CCLXIX.

CALLITHAMNION THUYOIDEUM, *Ag.*

GEN. CHAR. *Fronde* rosy or brownish red, filamentous; stem either opaque and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds, on distinct plants; 1, external *tetraspores*, scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed berry-like receptacles (*favellæ*) seated on the main branches, and containing numerous angular spores. CALLITHAMNION (*Lyngb.*), from κάλλος, *beauty*, and θάμνιον, *a little shrub*.

CALLITHAMNION *thuyoideum*; stem capillary, undivided, set with alternate, distichous, repeatedly pinnate branches, with a narrow lanceolate outline; branches furnished with bipinnate or tripinnate plumules; articulations of the branches 2–6 times, of the pinnules about twice as long as broad; tetraspores borne on the tips of the ultimate pinnules.

CALLITHAMNION *thuyoideum*, *Harv. in Hook. Br. Fl.* vol. ii. p. 346. *Harv. Man.* ed. 1. p. 111.

CALLITHAMNION *thuyoides*, *Ag. Sp. Alg.* vol. ii. p. 172. *Endl. 3rd. Suppl.* p. 34. *Kütz. Sp. Alg.* p. 645.

CALLITHAMNION *tripinnatum*, *Harv. in Hook. Br. Fl.* vol. ii. p. 346 (*not of Agardh*). *Wyatt, Alg. Danm.* no. 186.

CONFERVA *thuyoides*, *E. Bot.* t. 2205.

HAB. On rocks, near low-water mark, rare. Annual. Spring and Summer. Yarmouth, *Mr. Borrer*. Plymouth, *Mr. Iona*, &c. Pier, Torquay, *Mrs. Griffiths*. Falmouth, *Miss Warren*. Ilfracombe; and Bracelet Bay, Swansea, *Mr. Ralfs*. Wicklow, *W.H.H.* Portaferry, *Mr. W. Thompson*. Roundstone, *Mr. McCalla*.

GEOGR. DISTR. British Islands, and Atlantic coast of France.

DESCR. *Root* a minute disc. *Fronde* one to three inches long, densely tufted, perfectly distichous, with an ovate or flabellate outline. *Stem* mostly undivided, closely pinnated through its whole length with alternate, very patent branches, the lowest of which are longest, the rest gradually diminishing to the apex. These primary branches have a lanceolate outline, and are, with great regularity, pinnated with linear-lanceolate plumules, one rising from every articulation, and turned alternately to the right or left; the lowest plumules very short, the upper gradually longer and more compound, to the middle of the branch, thence gradually shortening towards its apex. *Plumules* bi- tripinnate, resembling the branches in miniature; the first plumule always given off from the upper side of the rachis. *Articulations* of the stem and branches very variable in length, commonly from four to six times as long as broad; but sometimes very short, with



swollen dissepiments :—those of the ramuli uniformly about twice as long as broad. *Favellæ* solitary or binate, bursting from the rachis of the plumules, variously lobed. *Tetraspores* minute, globose, terminal on the ultimate ramuli. *Colour* a rosy pink, or brownish red. *Substance* delicately membranaceous, soft and flaccid, most closely adhering to paper.

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One of the most *concinna* of the *Callithamnia*, elegant in all its minute parts, and strictly neat in its mode of growth. In essential character it closely approaches *C. gracillimum*, from which it is more to be distinguished by habit than by any very definite character. *C. gracillimum* is a larger and more tufted plant, more irregular in ramification, with longer and more indefinite plumules, varying much in the composition of its ramuli. Our present plant is rather robust, with an evident central stem and lateral branches, spreading with much regularity; each branch, as well as the plumules with which it is feathered, being of a narrow lanceolate outline. The plumules are very generally triply pinnate. *Favellæ* are much less commonly found on this species than tetraspores, and generally burst from the sides, and not the apex of a branchlet.

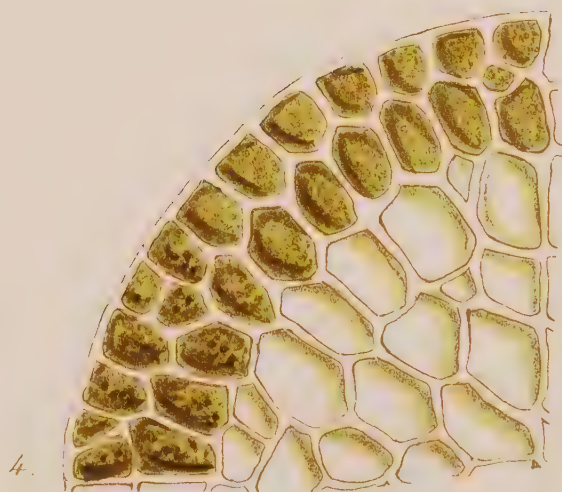
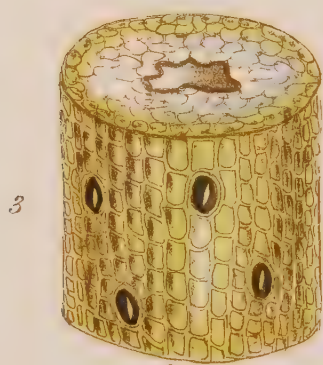
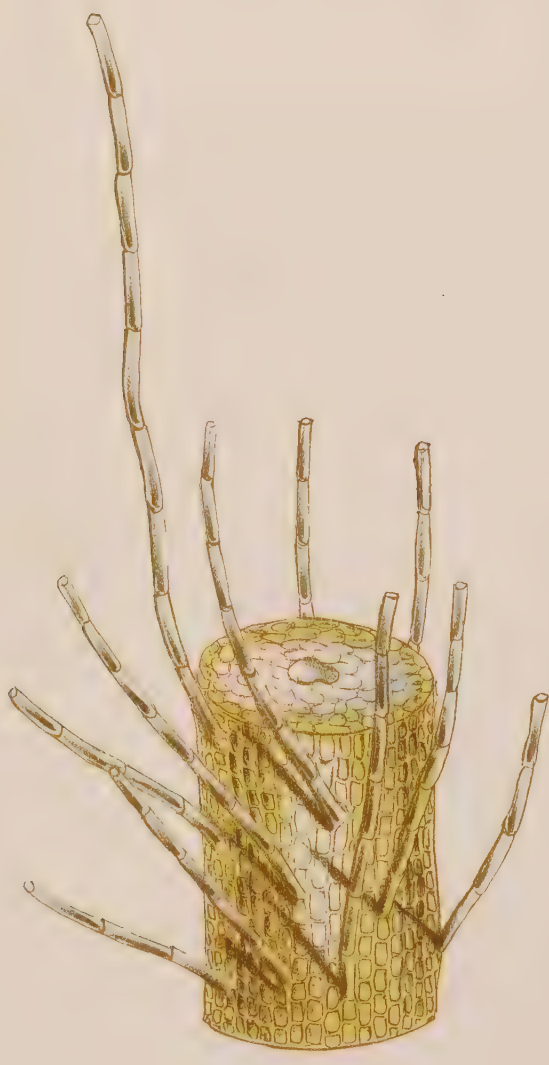
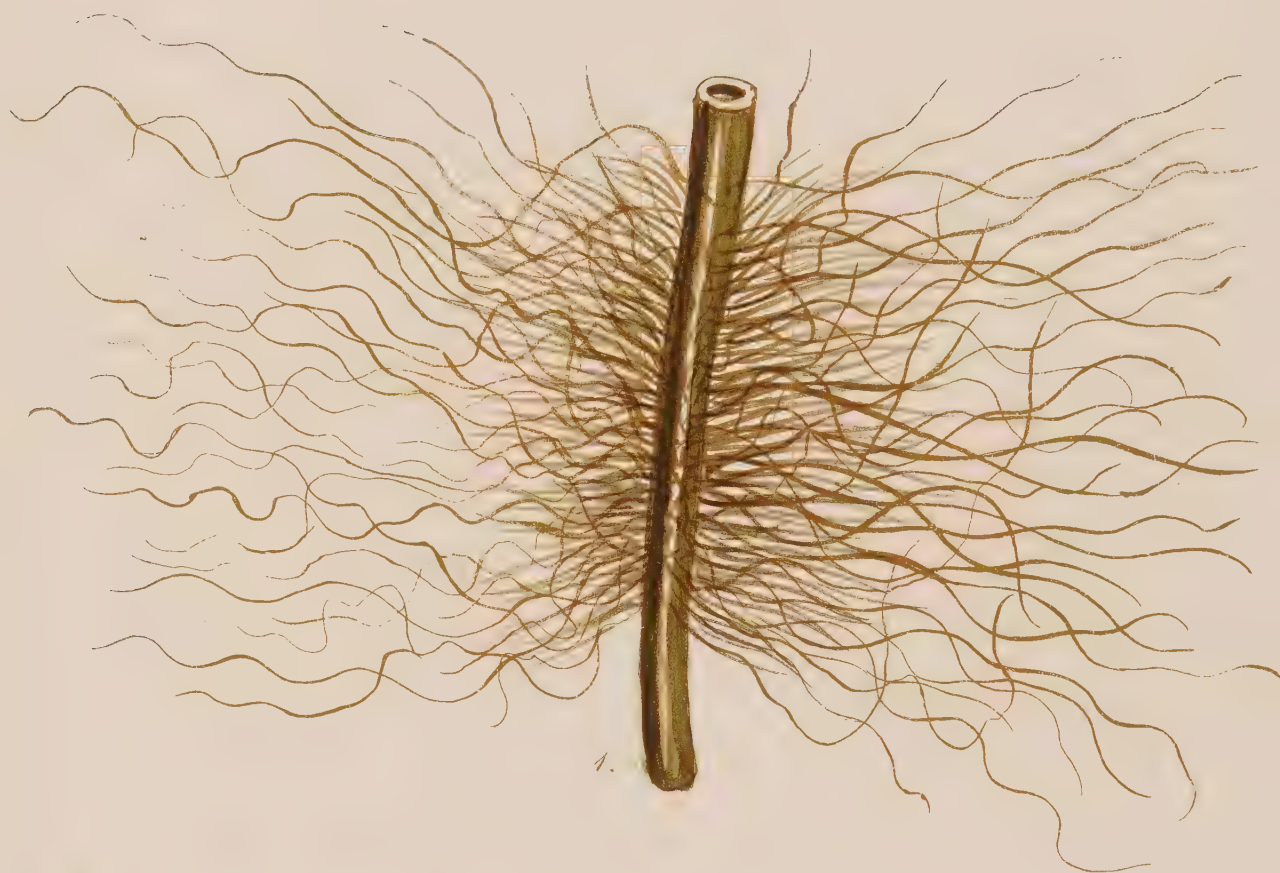
Though found in many places, *C. thuyoideum* must be ranked among the rarer forms of the genus.

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Fig. 1. *CALLITHAMNION THUYOIDEUM*; a frond :—*of the natural size*. 2. Two articulations from a branch, each bearing a plumule. 3. Pinna from the same, with tetraspores. 4. A tetraspore. 5. Abbreviated plumule bearing a favella :—*all more or less highly magnified*.

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## PLATE CCLXX.

LITOSIPHON PUSILLUS, *Har.*

GEN. CHAR. *Frond* unbranched, cylindrical, cartilaginous, subsolid, at length tubular, composed of several rows of cells; the surface areolated. *Fructification*; solitary or aggregated naked spores, scattered irregularly over the surface of the frond. LITOSIPHON (*Harv.*), from λιτός, *slender* or *mean*, and σίφων, a *tube*.

LITOSIPHON *pusillus*; fronds tufted, thread-shaped, very long, equal in diameter throughout, reticulated, clothed with pellucid hairs; spores scattered.

LITOSIPHON *pusillus*, *Harv. Man. Ed.* vol. ii. p. 43.

CHLOROSIPHON *pusillus*, *Harv. in Phyc. Brit.* vol. i. p. 10. *Kütz. Sp. Alg.* p. 484.

ASPEROCOCCUS *pusillus*, *Carm. in Hook. Br. Fl.* vol. ii. p. 277. *Wyatt, Alg. Danm.* no. 58. *Harv. in Mack. Fl. Hib.* part 3. p. 175. *Harv. Man. Ed.* vol. i. p. 35. *J. Ag. Gen. et Sp. Alg.* vol. i. p. 78.

HAB. Parasitical on CHORDA FILUM. Annual. Summer. Common all round the coast.

GEOGR. DISTR. Shores of Europe.

DESCR. *Fronds* very densely tufted, clothing the plant on which they grow in continuous series for the space of several feet, completely concealing the surface and spreading on all sides equally; from two to four inches long, as thick as hog's bristle, straight, or more commonly variously waved or twisted. When young the whole frond is beset with slender, byssoid, articulated fibres, like those found in *Myriotrichia*. These gradually wear away, and then the fronds become more twisted and less lubricous. In young plants the frond is nearly solid, composed of several strata of cells, the inner ones of which are large and empty, the outer gradually smaller, and those of the two or three external rows (constituting the periphery) filled with granulated endochrome. The central cells first perish, and the plant becomes tubular, but the tube does not seem to have regularly defined limits. The surface under the microscope appears reticulated with quadrate cells, which are disposed in longitudinal lines. Among these cells one is here and there larger and more prominent than the rest, containing a darker-coloured endochrome: these are supposed to be the spores, and no other fructification has yet been observed. *Substance* somewhat cartilaginous, but soft and lubricous, closely adhering to paper. *Colour* at first a greenish, afterwards a brownish olive.

The old fronds of *Chorda filum* are frequently infested, towards the close of summer, with the parasite here figured, which changes them into shaggy ropes, soft and slippery to the touch.

When placed in water the innumerable thread-like fronds of the *Litosiphon* stand out from the *Chorda*, and spread in all directions round it, like the hairs of a bottle-brush.

This plant was originally noticed by Capt. Carmichael, who called it *Asperococcus pusillus*, a name by which it has been generally known to succeeding botanists; although all have admitted that its claim to be regarded as a species of *Asperococcus* was, to say the least, very doubtful. In the list of species appended to the first volume of this work I called it *Chlorosiphon*, supposing that it must be the plant called by Kützing *Chlorosiphon Shuttleworthianus*, a name given by that author to an Alga gathered by Mr. Shuttleworth, on the West Coast of Ireland. I made this reference after reading the description in Kützing's work, but a subsequent communication with that author showed me that I had committed an error, for a specimen of Mr. Shuttleworth's Alga kindly sent to me by Professor Kützing, proves to be that young state of *Chorda lomentaria*, to which Carmichael gave the name *Asperococcus castaneus*. In these circumstances it becomes necessary to bestow a new name on the present plant, and I have chosen one applicable in a double sense.

As a genus it seems to come nearest to *Dictyosiphon*, from which it obviously differs in having an unbranched frond. I am not at all satisfied respecting the nature of the so-called spores, but no other fructification has yet been discovered.

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Fig. 1. *LITOSIPHON PUSILLUS*, growing on *Chorda filum*:—of the natural size.  
2. Part of a young frond. 3. Part of an older frond, with spores.  
5. Quarter of a transverse section of the frond:—more or less highly magnified.

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## PLATE CCLXXI.

FUCUS CERANOIDES, *Linn.*

GEN. CHAR. *Fron*d linear, either flat, compressed, or cylindrical, dichotomous (rarely pinnated), coriaceous. *Air-vessels*, when present, innate, simple. *Receptacles* either terminal or lateral, filled with mucus, traversed by a net-work of jointed fibres, pierced by numerous pores, which communicate with immersed, spherical *conceptacles*, containing parietal *spores*, or *antheridia*, or both. FUCUS (*L.*),—from *φυκος*, a sea-weed.

FUCUS *ceranoides*; frond plane, coriaceo-membranaceous, linear, subdichotomous, entire at the margin, midribbed, without vesicles; lateral branches narrower than the frond, repeatedly forked, level-topped, bearing fruit in their apices; receptacles spindle-shaped or bifid, acute.

FUCUS *ceranoides*, *Linn. Sp. Pl.* p. 1626. *Fl. Lapp.* p. 366. *Stack. Ner. Brit.* p. 71. t. 13. *Good. and Woodw. Linn. Trans.* vol. iii. p. 149. *Turn. Syn. Fuc.* vol. i. p. 136. *Turn. Hist.* t. 89. *Engl. Bot.* t. 2115. *Lyngb. Hyd. Dan.* p. 5. *Ag. Sp. Alg.* vol. i. p. 93. *Ag. Syst.* p. 277. *Grev. Alg. Brit.* p. 14. *Hook. Br. Fl.* vol. ii. p. 267. *Harv. in Mack. Fl. Hib.* part 3. p. 168. *Harv. Man.* ed. 2. p. 19. *Wyatt, Alg. Danm.* no. 154. *J. Ag. Gen. et Sp. Alg.* vol. i. p. 209. *Kütz. Phyc. Un.* p. 352. *Sp. Alg.* p. 590.

FUCUS *distichus*, *Esper, Ic. Fuc.* vol. ii. p. 62. t. 139. (*excl. syn.*)

HAB. On rocks and stones between tide-marks; seldom, except in places where fresh-water streams enter the sea; often in land-locked bays, and estuaries. Perennial. Spring and summer. Many places from Orkney to Cornwall.

GEOGR. DISTR. Atlantic shores of Europe, most frequent in the north. East coast of North America.

DESCR. *Root* a conical disc. *Fron*d from one to two feet in length, much divided in a manner between pinnate and dichotomous, the original branching being dichotomous, and becoming more or less pinnated by the growth of lateral branches; consisting of a midribbed, linear, coriaceous, but thin, membrane, perfectly entire at the edges and destitute of vesicles. The main branches are from a quarter of an inch to half an inch or more in breadth, and always about twice as broad as the lateral branches: they are distantly and pretty regularly forked, with patent, obtuse or emarginate apices. The lateral branches are alternate, or sometimes secund, springing from the sides of the main division; they are narrow, closely and repeatedly forked, level-topped, and as it were corymbose. *Receptacles* small, terminating the lateral branches, fusiform or doubly fusiform and forked, swollen, gelatinous within, and acute or acuminate. *Substance* much thinner and more transparent than in *F. vesiculosus*, but nevertheless coriaceous. *Colour* a greenish or brownish olive.



This species, in many respects, resembles *F. vesiculosus*, with some varieties of which it has been occasionally confounded ; but it has many characters by which it may at all times be known, independently of the absence of vesicles,—which character is too variable to be depended on, for in many forms of *F. vesiculosus* vesicles are wanting. *F. ceranoides* may be readily known by its much thinner and more transparent substance, and by containing a less quantity of saline matters ; so that it dries much more rapidly when removed from the water, and requires far less steeping in fresh water when specimens are prepared for the Herbarium.

The usual habitat of this species is in places where a good deal of fresh water mixes with the sea ; but it is by no means confined to such places. I have gathered specimens on exposed parts of the shore, where no fresh water flowed in. In the Loch of Stennis, Orkney, where the water is but faintly brackish, a very narrow variety is abundant. The greater the amount of saltness in the water the broader is the frond, but in no case is the substance so thick and leathery as in *F. vesiculosus*. The lateral fructification is very characteristic of this species, but is not essential, for there is a variety of *F. vesiculosus* figured by Dr. Greville having also lateral fruit.

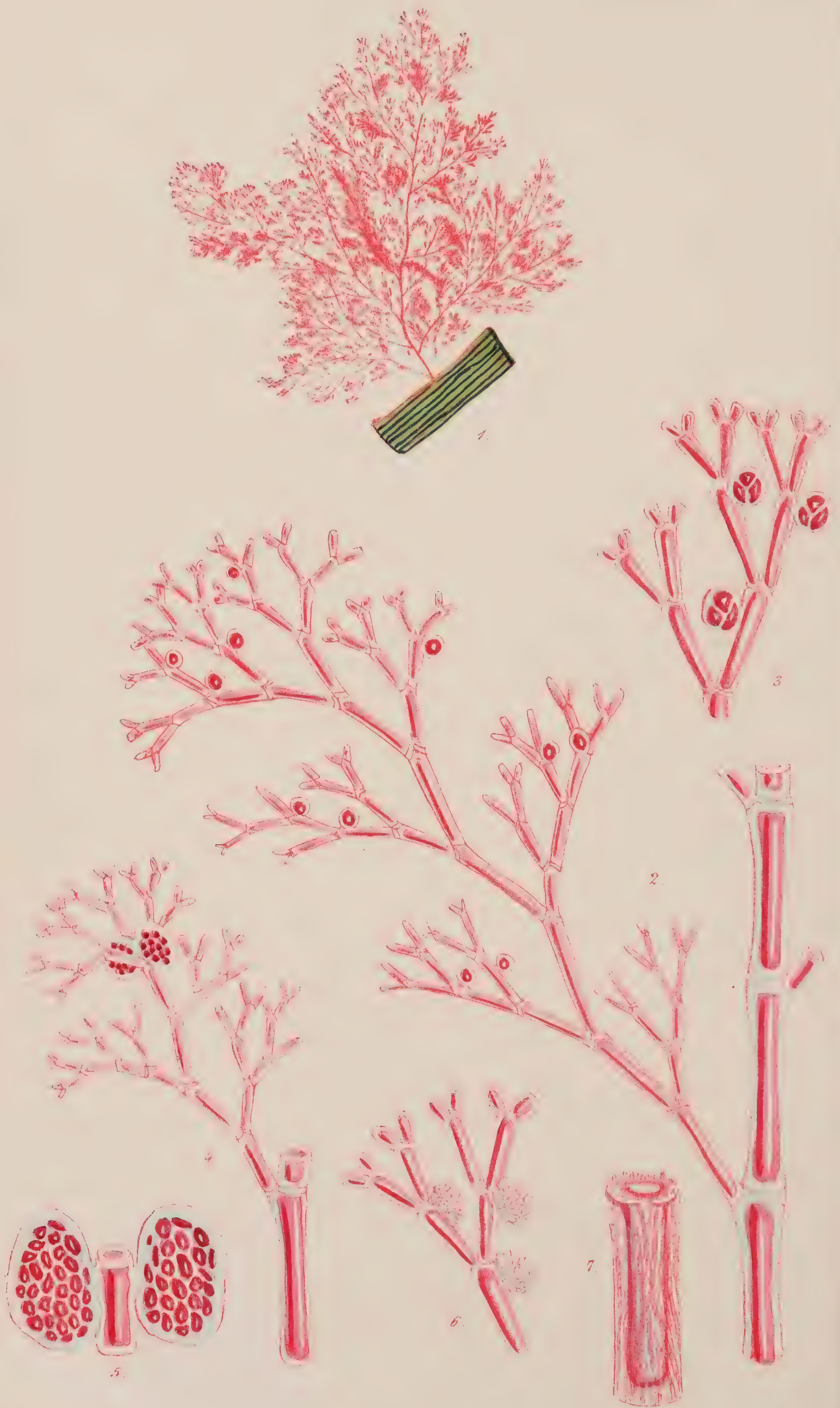
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Fig. 1. *FUCUS CERANOIDES* :—*the natural size*. 2. Section of one of the *conceptacles*, from the receptacle, containing spores and paranemata :—*magnified*.

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CALLITHAMNION CORYMBOSUM, *Ag.*

## PLATE CCLXXII.

GEN. CHAR. *Frond* rosy or brownish-red, filamentous; stem either opaque and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds, on distinct plants: 1, external *tetraspores* scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like receptacles (*favellæ*), seated on the main branches, and containing numerous angular spores. CALLITHAMNION (*Lyngb.*),—from *καλλος*, *beauty*, and *θαμνιον*, a *little shrub*.

CALLITHAMNION *corymbosum*; frond setaceous at the base, capillary and byssoid above, flaccid, gelatinous, excessively branched; secondary branches alternate, repeatedly dichotomous, subflabelliform, level-topped; ramuli many times forked, with patent axils; apices obtuse; articulations of the branches from eight to ten times as long as broad; tetraspores solitary, opposite the axils of the terminal forks, sessile, globose; favellæ binate, on truncated branches.

CALLITHAMNION *corymbosum*, *Ag. Sp. Alg.* vol. ii. p. 165. *Harv. in Hook. Br. Fl.* vol. ii. p. 346. *Harv. in Mack. Fl. Hib.* part 3. p. 216. *Harv. Man.* p. 112. *Wyatt, Alg. Danm.* no. 92.

CALLITHAMNION *versicolor*, *Ag. Sp. Alg.* vol. ii. p. 170. *Harv. in Hook. Br. Fl.* vol. ii. p. 346. *Harv. in Mack. Fl. Hib.* vol. ii. p. 165. *Harv. Man.* p. 112.

PHLEBOTHAMNION *corymbosum*, *Kütz. Phyc. Un.* p. 375. *Sp. Alg.* p. 657.

PHLEBOTHAMNION *versicolor*, *Kütz. Phyc. Un.* p. 375. *Sp. Alg.* p. 657.

CERAMIUM *corymbosum*, *Ag. Syn.* p. xxvii. *Ag. Syst.* p. 138.

CERAMIUM *versicolor*, *Ag. Syst.* p. 140.

CONFERVA *corymbosa*, *Eng. Bot.* t. 2352 (articulations too short).

HAB. On the leaves of *Zostera*, the fronds of various Algæ, and attached to rocks and stones, near low-water mark. Annual. Summer. Not uncommon, from Orkney to Cornwall.

GEOGR. DISTR. Atlantic and Mediterranean coasts of Europe. East coast of North America.

DESCR. *Root* minute, giving rise to a dense tuft, composed of numerous fronds. *Stem* one to three inches long, the smaller specimens more slender than human hair, the larger as thick as hog's bristles at base, soon attenuated and reduced to a byssoid fineness in the upper part of the plant, variable in ramification; sometimes dichotomous from the very base, with no trace of a leading stem; sometimes (and more frequently) having a leading, subsimple stem set with closely placed, alternate branches. These branches, in full-grown plants, are excessively divided, having an ovate or fan-shaped



outline, the branching being partly alternate, and partly dichotomous. The ultimate divisions, or ramuli, are more regularly forked, and level-topped, giving the tuft the appearance of being composed of innumerable minute corymbs, clothing the branches. *Articulations* of great length in all the main branches, destitute of veins, except towards the base of the stem and in very old fronds; those of the ultimate ramuli from three to four times as long as broad; all having a wide pellucid border surrounding the endochrome. *Favellæ* generally in pairs, terminating the secondary branches, and sometimes surrounded by a few forked ramuli. *Tetraspores* solitary, sessile, placed just below the forkings of the ultimate ramuli. *Colour* a fine rosy red, sometimes brownish, soon changing to orange in fresh water. *Substance* exceedingly tender, flaccid, and gelatinous, adhering most closely to paper in drying.

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A very variable plant: so much so, that most authors regard as distinct species two forms which I here bring together. Hitherto in British works we have recognized the original *Cal. corymbosum* of Eng. Bot., and the *Cal. versicolor* of Agardh, the differences between which are said to be, that the former is much more slender than the latter, with longer joints, a less evident stem, and a less pinnated branching. Some specimens are, indeed, very slender, and dichotomously divided, and others are robust, with an undivided stem and lateral branches; but between the most extreme forms I have seen too many intermediate states to admit of my regarding them as belonging to more than one specific type. I have examined several authentic specimens of Agardh's *C. versicolor* and compared them with our British plant so called, and can detect no differences between them. I therefore no longer hesitate to unite that synonyme to *Cal. corymbosum*.

The nearest affinity of the present plant is with *C. spongiosum*, a species much more densely branched and bushy, of a browner colour, with a very robust stem and very short articulations; but, like the present, remarkable for dichotomous, level-topped ramuli, and tetraspores placed opposite the alternate forkings.

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Fig. 1. CALLITHAMNION CORYMBOSUM, on a piece of *Zostera* leaf:—*the natural size*. 2. One of the ultimate forked branchlets, and some articulations of a secondary branch. 3. Ramuli with tetraspores. 4. A branch with favellæ. 5. The favellæ removed. 6. Ramulus with (so called) *antheridia*. 7. Veiny articulations from the base of the stem:—*all magnified*.

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## PLATE CCLXXIII.

ECTOCARPUS FASCICULATUS, *Harv.*

GEN. CHAR. *Filaments* capillary, jointed, olivaceous or brown, flaccid, without longitudinal striæ. *Fruit* either spherical or elliptical, external or imbedded spores; or lanceolate, linear, or conical *silicules* (pod-like bodies); or granular masses formed in consecutive cells of the branches. ECTOCARPUS (*Lyngb.*),—from *εκτος, καρπος*, *external fruit*.

ECTOCARPUS *fasciculatus*; tufts olivaceous, dense; main filaments not much divided; the branches distant, set throughout with alternate or secund fascicles of subulate ramuli; the ramuli generally secund in each multifid fascicle; silicules sessile, secund, close together, ovate-acuminate or subulate.

ECTOCARPUS *fasciculatus*, *Harv. Man.* ed. 1. p. 40; ed. 2, p. 59. *Wyatt, Alg. Danm.* no. 302. *Kütz. Phyc. Un.* p. 288. *Sp. Alg.* p. 451. *J. Agardh, Sp. Alg.* p. 22.

HAB. Between tide-marks, on the larger Algæ; most commonly on *Laminaria digitata*.

GEOGR. DISTR. Atlantic shores of Europe and North America.

DESCR. *Filaments* densely tufted, from three to six or eight inches long, somewhat entangled together at the base into ropy bundles, free and feathery above, less branched than in most others of the genus, but nevertheless repeatedly divided. The ramification is irregular, between alternate and dichotomous, and the lesser branches especially are often flexuous or angularly bent. They are distantly branched, with patent axils, and furnished along their whole length with short, multifid ramuli, crowded together; not strictly *fasciculate*, it is true, but appearing so to the eye and to a moderately powerful lens. The ramuli are in truth secund, closely set, and often overlapping each other, a ramulus rising from each successive articulation of the penultimate branchlet. *Articulations* about twice as long as broad, containing a dense endochrome, with a wide border. *Silicules* very abundant, varying much in length, ovate-acuminate or subulate, very acute, densely striate transversely. *Colour* when young a deep, greenish olive, becoming pale and at length foxy in age. *Substance* membranaceous, soft, closely adhering to paper in drying when the plant is young—much less adhesive when old.

An exceedingly common species, easily recognized by the dense ramuli which appear to the naked eye to be tufted, but which are really only closely placed, and secund on the penultimate branchlets. The favourite habitat of *E. fasciculatus* is on

the expanded fronds of *Lam. digitata*, where it often fringes the segments in continuous tufts, but it is not confined to that plant, but is commonly found also on *L. bulbosa* and on *Himanthalia lorea*, and others of the larger fucoid Algæ. When young and well grown it is a very handsome species, but soon becomes coarse and ropy, and towards the close of the season is very much infested with *Diatomaceous* parasites.

I have received numerous specimens from correspondents in North America, in which country this would appear to be one of the most abundant of the genus.

The silicules are generally strictly sessile, but vary in form from linear-subulate to nearly ovate-acute.

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Fig. 1. ECTOCARPUS FASCICULATUS:—*the natural size*. 2. Branch with fasciculate ramuli. 3. Branchlet with silicules:—*both magnified*.

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## PLATE CCLXXIV.

CALLITHAMNION ARBUSCULA, *Lyngb.*

GEN. CHAR. *Fronde* rosy or brownish-red, filamentous; stem either opaque and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds, on distinct plants; 1, external *tetraspores*, scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like receptacles (*favellæ*) seated on the main branches, and containing numerous angular spores. CALLITHAMNION (*Lyngb.*), from *καλλος*, *beauty*, and *θαμνιον*, *a little shrub*.

CALLITHAMNION *arbuscula*; stems naked below, inarticulate, robust, cartilaginous, the main divisions set with shorter branches, which are densely clothed on all sides with minute, imbricated, pinnated ramuli (plumules); ultimate pinnules simple or forked, recurved, acute, articulated, the articulations twice as long as broad; tetraspores globose, numerous, sessile on the upper edge of the pinnules.

CALLITHAMNION *arbuscula*, *Lyngb. Hyd. Dan.* p. 123. t. 38. *Harv. in Hook. Br. Fl.* vol. ii. p. 340. *Harv. in Mack. Fl. Hib.* part 3. p. 213. *Harv. Man.* ed. 1. p. 105.

PHLEBOTHAMNION *arbuscula*, *Kütz. Sp. Alg.* p. 656.

DASYA *spongiosa*, *Ag. Sp. Alg.* vol. ii. p. 121.

CONFERVA *arbuscula*, *R. Br.* — *Dillw.* t. 85. (excl. t. G.) *E. Bot.* t. 1916.

HAB. On rocks and mussel-shells, near low-water mark, usually in places left bare on the recess of the tide; also in tide-pools. Perennial. Summer and autumn. Abundant on the western shores of Scotland and Ireland; rare on the eastern. Frith of Forth, *Drs. Greville* and *Arnott*. Aberdeen, common, *Dr. Dickie*. Orkney, *Rev. J. H. Pollexfen*.

GEOGR. DISTR. The Ferroe Islands (and probably elsewhere in the Northern Sea).

DESCR. *Root* a fleshy, conical disc. *Fronde*s several from the same base, from two to five or six inches high, as thick as small twine below, attenuated upwards, opaque, and without visible articulation, much branched and shrub-like. *Stems* naked below, densely set with lateral branches above, and these furnished with other smaller ones, spreading on all sides and making a bushy or shrub-like head. The lesser branches, which are from a quarter to half an inch in length, are densely clothed with minute, closely imbricated plumules, a line or two in length, which make each little branch cylindrical, and, being very dense towards the tips, give the apices of the branches a strikingly blunt, corymbose aspect. The plumules have a flexuous rachis, set with alternate, simple, or once forked, horizontally patent or reflexed pinnules. *Favellæ* of small size, binate or clustered, springing from the rachis of the plumules. *Tetraspores* sessile, spherical, of small



size, plentifully borne along the upper or inner edge of the ramuli, a tetraspore usually springing from every articulation. *Substance* in the stem and branches cartilaginous, flaccid in the ramuli. *Colour* a dark vinous red, inclining to purple, or sometimes to brown; staining fresh water carmine. Under the microscope the colour of the ramuli is a clear crimson lake.

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The most robust and bushy of all the British *Callithamnion*, and therefore well named *Arbuscula*. The main stem is often upwards of a line in diameter, and divided into several stout branches, densely clothed with finely divided ramuli. The colour is always very dark, varying from brownish to a more or less vivid vinous purple. No species can well be confounded with the present, except, perhaps, very luxuriant specimens of *C. spongiosum*, but the microscopic characters of that species are extremely different. Formerly *Cal. arbuscula* was confounded with *Dasya arbuscula*, a mistake which could only arise from a very hasty examination of very imperfect specimens, for independently of generic character the plants are very different. In the *Dasya* the ramuli are dichotomous, and here they are pinnated, and far more densely crowded.

*C. arbuscula* is extremely abundant on the western coasts of Ireland and Scotland, and has been found on several parts of the east of Scotland; but is unknown in the east and south of Ireland, and has not, that I am aware of, been found in England. It delights on the most exposed rocks and the roughest water, and very commonly grows on the shells of *Mytilus rugosus*, in places where it is left dry for some hours each tide.

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Fig. 1. CALLITHAMNION ARBUSCULA, growing on *Mytilus rugosus*:—*the natural size*. 2. Lesser branch clothed with plumules. 3. Segment of a small branch. 4. Plumule with tetraspores. 5. A ramulus and tetraspores from the same. 6. Plumule with favellæ. 7. Favellæ from the same:—*all magnified*.

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## PLATE CCLXXV.

CLADOPHORA ALBIDA, *Kütz.*

GEN. CHAR. *Filaments* green, jointed, attached, uniform, branched. *Fruit*, aggregated granules or zoospores, contained in the articulations, having, at some period, a proper ciliary motion. CLADOPHORA (*Kütz.*), —from κλαδος, a *branch*, and φέρω, to *bear*.

CLADOPHORA *albida*; filaments exceedingly slender, flaccid, pale yellow green (whitish when dry), forming dense, silky, or somewhat spongy, soft, intricate tufts; branches crowded, irregular, the uppermost patent and mostly opposite; ramuli opposite or secund; articulations four or five times as long as broad.

CLADOPHORA *albida*, *Kütz. Phyc. Un.* p. 267. *Sp. Alg.* p. 400. *Hassall*, p. 224.

CONFERVA *albida*, *Huds. Fl. Ang.* p. 595. *Dillw. Conf.* p. 66. t. E. *E. Bot.* t. 2327. *Harv. in Hook. Br. Fl.* vol. ii. p. 358. *Harv. in Mack. Fl. Hib.* part 3. p. 229. *Harv. Man.* ed. 1. p. 138. *Wyatt, Alg. Danm.* no. 96.

HAB. On rocks and Algæ, between tide-marks, usually near low-water mark. Annual. Summer. Not uncommon on the southern shores of England, and the south and west of Ireland.

GEOGR. DISTR. Shores of Europe?

DESCR. *Tufts* six to twelve inches long, dense, soft and silky, retaining water like a sponge. *Filaments* inextricable, often rolled together below into thick rope-like bundles, mostly free and feathery above, exceedingly slender and excessively branched. It is impossible to follow the branching through the whole plant, but when small fragments broken from the lesser divisions are placed under the microscope, the branching seems partly opposite and partly secund: the penultimate branchlets are usually opposite and very patent; the ultimate ramuli generally short and secund. The upper branches are not much more slender than the lower, and the articulations, throughout the frond, are nearly uniformly from four to five times as long as broad. The colour is a pale, and peculiarly pleasant, yellowish green, fading in the herbarium to a dull whitish green without gloss. The substance is soft and flaccid, and the plant adheres pretty strongly to paper in drying.

A handsome species, and one of the earliest recognized, distinguished from most of our common kinds by the tenuity and softness of the filaments, their length, and the uniformly short articulations. It is most nearly related to *C. refracta*, with which Agardh unites it, but is a taller plant with less patent and



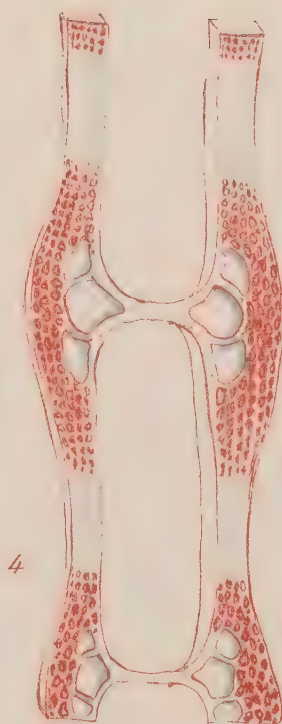
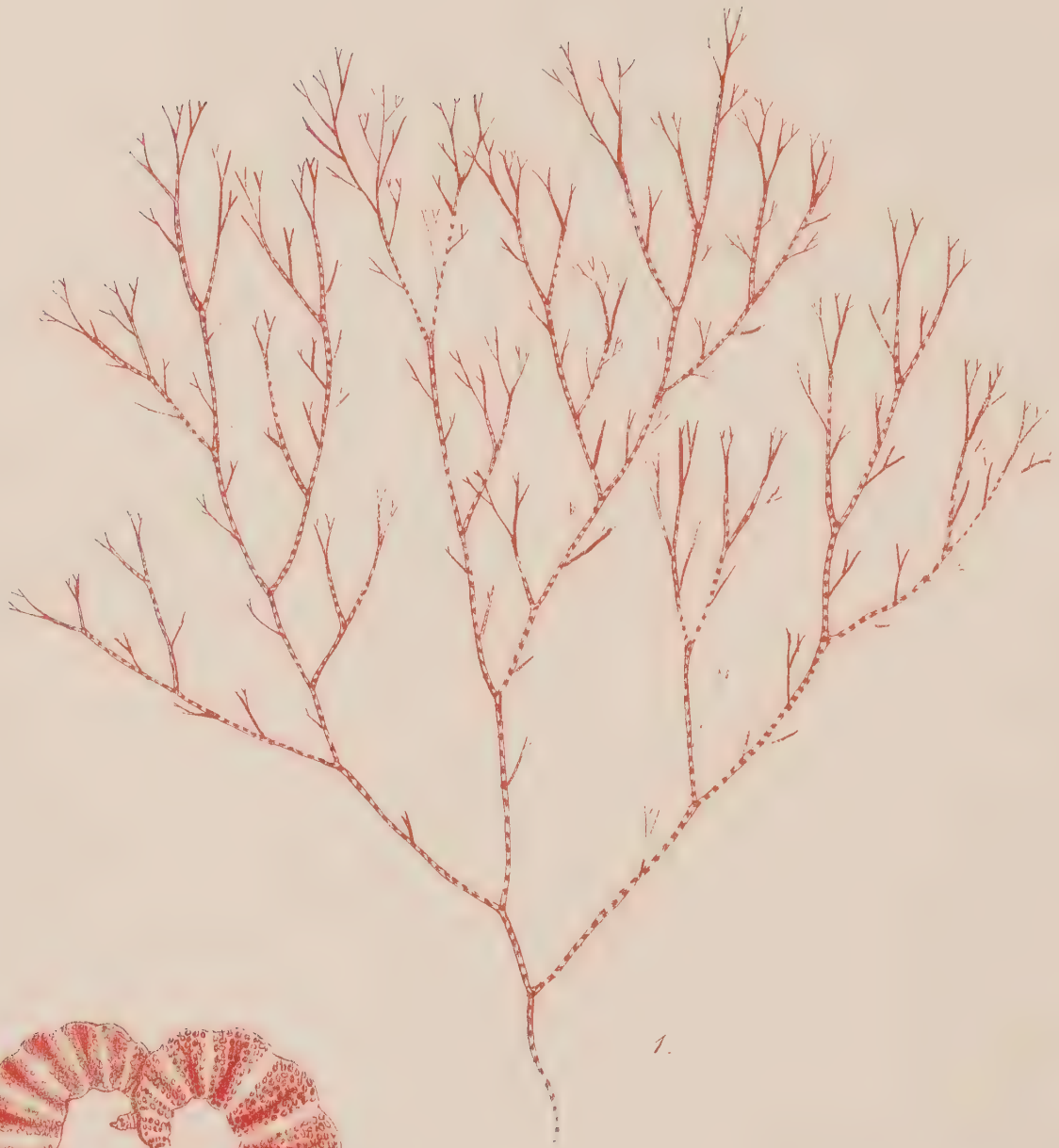
less compound ramification, a softer substance, a paler colour, and altogether a different aspect. I confess, however, that it is difficult at all times to affix clear limits between these species. Neither are uncommon on rocky shores between tide-marks.

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Fig. 1. CLADOPHORA ALBIDA :—*the natural size*. 2. Small part of a branch :—*magnified*. 3. Ramuli :—*more highly magnified*.

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## PLATE CCLXXVI.

CERAMIUM DECURRENS, *Kütz.*

GEN. CHAR. *Fronde* filiform, one-tubed, articulated; the dissepiments coated with a stratum of coloured cellules, which sometimes extend over the surface of the articulation. *Fructification* of two kinds, on distinct individuals: 1, *tetraspores* either immersed in the ramuli or more or less external; 2, sessile, roundish *receptacles* (*favellæ*) having a pellucid limbus, containing minute, angular spores, and subtended by one or more short, involucral ramuli. CERAMIUM (*Roth*),—from *κεραμος*, a *pitcher*; but the fruit is *not* pitcher-shaped.

CERAMIUM *decurrens*; frond robust, gradually attenuated upwards, dichotomous, with few lateral branchlets, the apices hooked inwards; articulations partially coated with coloured cellules, which extend from the dissepiment at each end, but leave a colourless, pellucid space in the centre of the articulation; lowermost articulations twice as long as broad, upper very short.

CERAMIUM *decurrens*. *Harv. Man.* ed. 2. p. 162.

HORMOCERAS *decurrens* ( $\beta$ . *majus*), *Kütz. in Linn.* vol. xv. p. 733. *Kütz. Phyc. Gen.* p. 379. *Sp. Alg.* p. 675.

HAB. On the smaller Algæ in tide-pools. Rare? Annual. August. On the Harbrich, at Torquay, *Mrs. Griffiths* (1844).

GEOGR. DISTR. Mediterranean Sea.

DESCR. *Fronde* (in British specimens) six to eight inches long, as thick as hog's bristle below, gradually attenuated upwards, and capillary above, repeatedly and pretty regularly dichotomous, but scarcely fastigate; the lower divisions of the frond distant, the upper more and more approximating. A few simple or forked short ramuli are scattered here and there along the branches. *Articulations* in the lower part of the frond about twice as long as broad, their upper and lower parts covered with coloured cellules, disposed in longitudinal lines; their middle colourless and bare. In the upper divisions of the frond and in the ramuli the articulations are very short, coated with cells except a narrow central pellucid band. The apices are strongly hooked inwards. I have not seen any fructification. *Colour* a full red, something like the colour of brick-dust, with a slightly purplish hue. *Substance* membranaceous, not very closely adhering to paper.

The original *C. decurrens* of Kützinger is described as being "minute, scarcely an inch long, and capillary:"—the plant here figured is considered by that author, to whom I transmitted a specimen, to be a larger variety of the species, agreeing in all

characters except in size with his specimens. I trust, therefore, that in adopting the specific name I am not committing an error, although, were I to form my judgment of *C. decurrens* on the diagnosis assigned to it by its founder, I should not have referred to it the specimens here figured.

Our *C. decurrens* seems to be almost exactly intermediate between *C. rubrum* and *C. diaphanum*. It agrees with the former in size, but differs in having a translucent space, destitute of coloured cells, in the middle of each internode. From *C. diaphanum* it differs chiefly in having the lines of coloured cells which clothe the nodes continued over a considerable space of the articulation, and thus, as it were, *decurrent* along the stem. The exact disposition of these cells, and the structure of the stem, is well seen when a longitudinal slice is taken, as at fig. 4. The minute coloured cells will then be found immersed in the transparent walls of the frond.

I have seen no other specimens than those found at Torquay, one of which is here figured. There is a variety of *C. rubrum* which I once confounded with *C. decurrens*, from its having a pale or transparent band in the centre of the internode;—but this variety, when examined more closely, will be found to have the whole of its walls traversed by strings of cells, but having those of the centre part colourless or pale.

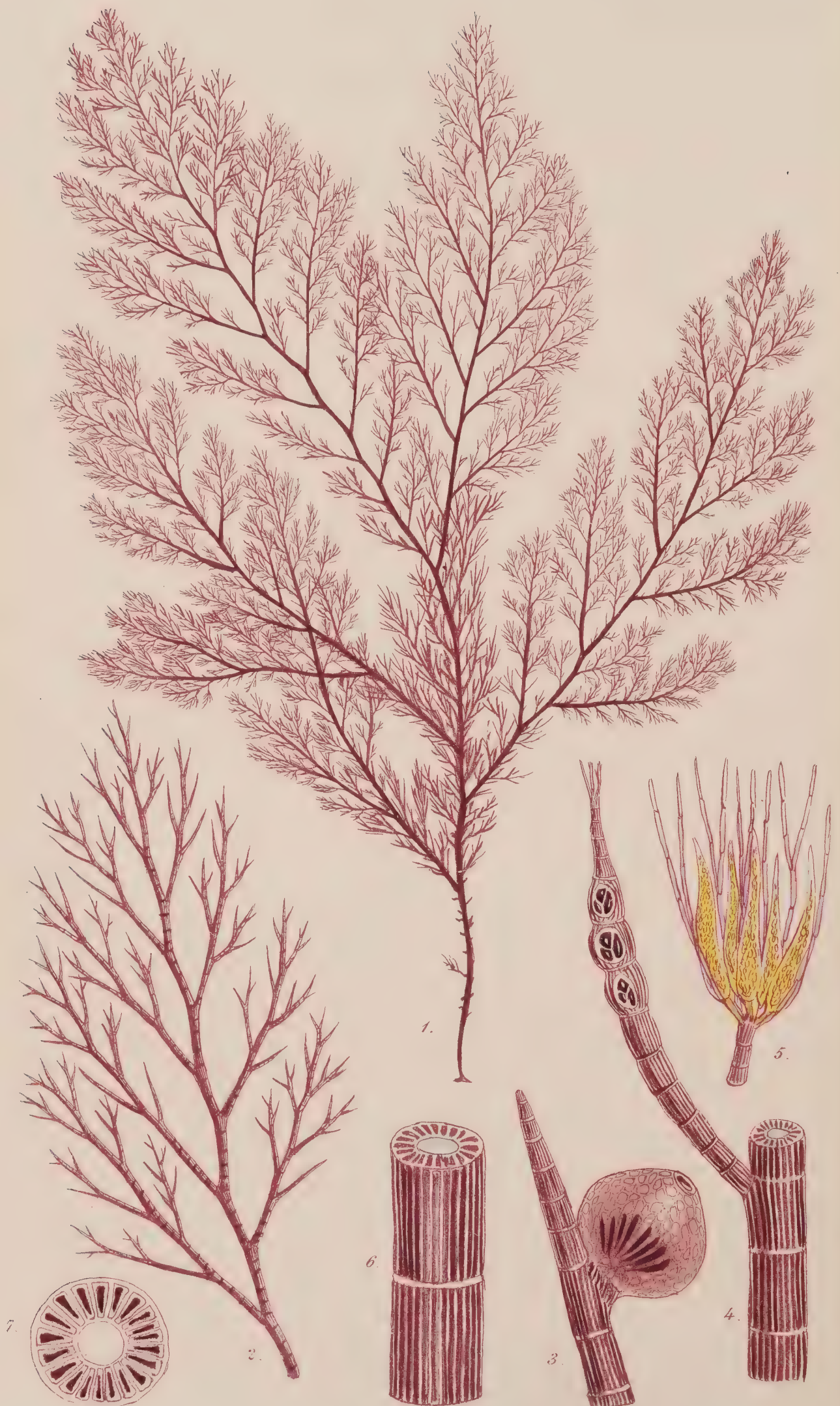
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Fig. 1. CERAMIIUM DECURRENS,  $\beta$ . *majus*:—*the natural size*. 2. Apex of a branch. 3. Articulations from the middle of a branch. 4. Vertical section of the same:—*all highly magnified*.

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## PLATE CCLXXVII.

POLYSIPHONIA NIGRESCENS, *Grev.*


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GEN. CHAR. *Frond* filamentous, partially or generally articulate; joints longitudinally striate, composed of numerous radiating cells or tubes, disposed round a central cavity. *Fructification* twofold, on different individuals: 1, ovate *capsules* (*ceramidia*) furnished with a terminal pore, and containing a tuft of pear-shaped spores; 2, *tetraspores* imbedded in swollen branches. POLYSIPHONIA (*Grev.*), — from *πολυς*, *many*, and *σιφων*, *a tube*.

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POLYSIPHONIA *nigrescens*; fronds robust, rigid, and generally rough with broken branches below, much branched and bushy above; the branches alternate, repeatedly divided in a pinnate manner; ramuli distant, elongated, awl-shaped, alternate, the upper ones sometimes having a few processes near the tips; lower articulations short, upper rather longer than broad; siphons about twenty, surrounding a large tube; *ceramidia* broadly ovate, sessile or nearly so.

POLYSIPHONIA *nigrescens*, *Harv. in Hook. Br. Fl.* vol. ii. p. 332. *Wyatt, Alg. Danm.* no. 135. *Harv. in Mack. Fl. Hib.* part 3. p. 208. *Harv. Man.* ed. 1. p. 88. ed. 2. p. 89. *Endl. 3rd Suppl.* p. 45. *Kütz. Phyc. Un.* p. 421. t. 50. iv. *Sp. Alg.* p. 813.

POLYSIPHONIA *fucoides*, *Grev. Fl. Edin.* p. 308.

HUTCHINSIA *nigrescens*, *Lyngb. Hyd. Dan.* p. 109. t. 33. *Ag. Syst.* p. 151. *Ag. Sp. Alg.* vol. ii. p. 69.

HUTCHINSIA *fucoides*, *Hook. Fl. Scot.* part 2. p. 87.

CONFERVA *nigrescens*, *Huds. Fl. Ang.* p. 602. (?) *Dillw. Conf.* no. 155. *Eng. Bot.* t. 1717.

CONFERVA *fucoides*, *Huds. Fl. Ang.* p. 603. *With.* vol. iv. p. 141. *Dillw. Conf.* t. 75. *Eng. Bot.* t. 1743.

HAB. On rocks, and stones, and attached to Algæ, &c., between tide-marks. Perennial? Summer. Abundant on the British shores.

GEOGR. DISTR. Atlantic shores of Europe and America. New Zealand.

DESCR. *Root* a small, discoid expansion. *Fronds* many from the same base, from three to twelve inches long or more, sometimes very slender and almost capillary, sometimes robust, twice as thick as hog's bristle, simple below, very much branched and bushy above. The ramification, like almost every other character of this variable plant, is subject to many anomalies. In what may be considered the typical form, the stem divides into several principal branches, and the frond when displayed is broadly flabelliform in outline. Each main branch is obovate, and closely pinnated with alternate, erecto-patent secondary branches of similar outline; and these latter are doubly pinnate. The ultimate pinnules are subulate, distantly placed, regularly alternate, rather erect, and either quite simple or having one or



two thorn-like processes near the apex. In other varieties the decompound-pinnate character is less obvious; there is less distinction into a primary stem and branches, and all parts of the frond are more erect, sometimes being very erect. In other specimens the lateral pinnae are short and nearly simple: and in a singular variety (possibly a species) found by Mrs. Griffiths, at Larderham, Torbay, every division of the plant is patent and divaricate, and the substance stiff and rigid. Late in the season the finer upper ramuli disappear; the frond becomes unsightly and distorted, and rough with the stumps of its broken ramuli. In this state it survives through the winter, and next spring produces a new and copious crop of branches. *Ceramidia* nearly sessile, broadly ovate. *Tetraspores* immersed in the tips of distorted ramuli. *Siphons* about twenty, narrow, surrounding a large cavity. *Colour* purple in the finer branches, very dark, and brownish below, rarely brown-red; darkening and almost blackening in drying. *Substance* in the stem rigid; in the ramuli soft, flaccid, and adhering, but not strongly, to paper.



This species varies considerably in appearance according to the time of year at which the specimens are collected, the autumnal or winter individuals being coarse and bushy, with crowded ramuli, while those gathered in spring and summer are of the feathery character represented in our figure. Some are of a dark purple, and others are of a dull brown, or pale; but all become much darker and even black in drying. From all the British species of the section to which it belongs, *P. nigrescens* may be known by the distantly pinnated ramuli, the very large number of siphons, and the comparatively wide central tube. When bearing antheridia the tips of the branches are yellow.

I am unable to distinguish *P. atropurpurea* from a common form of the species.



Fig. 1. POLYSIPHONIA NIGRESCENS:—*the natural size*. 2. A small branch. 3. Apex of a ramulus with ceramidium. 4. Ramulus with tetraspores. 5. Antheridia. 6. Articulations of the stem. 7. Transverse section of the stem:—*all magnified*.









## PLATE CCLXXVIII.

POLYSIPHONIA SIMULANS, *Harv.*

GEN. CHAR. *Frond* filamentous, partially or generally articulate; joints longitudinally striate, composed of numerous radiating cells or tubes, disposed round a central cavity. *Fructification* twofold, on different individuals: 1, ovate *capsules* (*ceramidia*) furnished with a terminal pore, and containing a tuft of pear-shaped spores; 2, *tetraspores* imbedded in swollen branchlets. POLYSIPHONIA (*Grev.*), — from *πολυς*, *many*, and *σιφων*, a *tube*.

POLYSIPHONIA *simulans*; filaments slender, bushy, branched from the base; branches alternate, patent, repeatedly (but irregularly) pinnate; the penultimate branches long and simple, set with short, distant, spine-like ramuli; articulations of the branches once and half as long as broad, of the ramuli shorter, many-tubed; siphons about twelve; *ceramidia* globose or ovate.

POLYSIPHONIA *simulans*, *Harv. Man.* ed. 2. p. 89.

POLYSIPHONIA *spinulosa*, *Griff. in Harv. Man.* ed. 1. p. 87. (*not of Grev.*)

POLYSIPHONIA *divergens*,  $\gamma$  *Grevilleana*, *Kütz. Sp. Alg.* p. 822. (Torquay specimens.)

HAB. On rocks, &c., in tide-pools near low-water mark. Annual? Summer. Rare. Bathing Cove, Torquay and Torabbey Rocks, *Mrs. Griffiths*. Bovisand, *Rev. W. S. Hore*. Jersey, *Miss White* and *Miss Turner*. Valentia, Kerry, *W. H. H. Skaill*, Orkney, *Rev. J. H. Pollexfen*.

GEOGR. DISTR. Not noticed out of Britain.

DESCR. *Fronds* densely tufted, two or three inches high, branched from the base and bushy, setaceous below, capillary above, irregularly divided. *Branches* alternate, somewhat pinnate, not perfectly distichous, decompound, the divisions set with short, subulate, scattered, spine-like ramuli, and connected together by irregular spine-like processes, so that the lesser divisions are difficult to spread out. *Articulations* of the stem and branches about once and half as long as broad, of the ramuli very short, with pellucid dissepiments, multistriate; siphons about twelve, surrounding a small central tube. *Ceramidia* ovate, sessile, scattered on the smaller branches. *Tetraspores* immersed in slightly swollen ramuli. *Colour* a dull reddish-brown, or dark brown-red. *Substance* stiff and brittle, becoming flaccid in fresh water, and then adhering to paper.

In the first edition of my "Manual," I fell into an error in confounding this species with *P. spinulosa* of Greville, a plant to



which it bears only an outward resemblance, differing very essentially in microscopic characters. In the original *P. spinulosa* there are but *four* siphons surrounding the central cavity; here there are *twelve*. By comparing the figure now given, with that of *P. subulifera*, it will be seen that there is a much nearer relationship to that species than to any other British one, and except for some differences of habit, and minor differences in structure, the two might perhaps be brought together. Prof. J. Agardh, however, who saw specimens of our *P. simulans* during his visit to England, pronounced them distinct, an opinion also entertained by Mrs. Griffiths, and in which, though not without misgivings, I concur. As it is no longer possible to retain the name *spinulosa* for the plant here figured, I propose that of *simulans*, alluding to its deceptive character;—for it looks sometimes like *P. subulifera*, sometimes like *P. nigrescens*, and has been mistaken, as we have seen, for *P. spinulosa*.

It is one of our rarer species, although found in several distant localities.

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Fig. 1. POLYSIPHONIA SIMULANS:—*the natural size*. 2. A small branch. 3. Ceramidium. 4. Ramulus with imbedded tetraspores. 5. Joints from the stem, and young ramulus with apical fibres. 6. Transverse section of the stem:—*all magnified*.

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## PLATE CCLXXIX.

CALLITHAMNION HOOKERI, *Ag.*

GEN. CHAR. *Fronde* rosy or brownish-red, filamentous; stem either opaque and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds, on distinct plants: 1, external *tetraspores*, scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like receptacles (*favellæ*) seated on the main branches, and containing numerous angular spores. CALLITHAMNION (*Lyngb.*), from *καλλος*, *beauty*, and *θαμνιον*, *a little shrub*.

CALLITHAMNION *Hookeri*; stem setaceous, inarticulate or nearly opaque, with traces of joints, simple, set with one or more series of alternate, spreading, flexuous branches, the smaller of which are articulated, and all densely plumulate; plumules patent, naked below, pinnate or subbipinnate above; the pinnæ or pinnules subhorizontal or divaricate, the lowest longest; articulations twice or thrice as long as broad; tetraspores numerous, sessile on the pinnules; favellæ terminal, binate.

CALLITHAMNION *Hookeri*, *Ag. Sp. Alg.* vol. ii. p. 179. *Harv. in Hook. Br. Fl.* vol. ii. p. 341. *Harv. Man.* ed. 1. p. 106.

CALLITHAMNION *lanosum*, *Harv. in Hook. Br. Fl.* vol. ii. p. 341. *Wyatt, Alg. Dan.* no. 139.

CALLITHAMNION *spinosum*, *Harv. in Hook. Br. Fl.* vol. ii. p. 345. *Harv. Man.* ed. 1. p. 111.

PHLEBOTHAMNION *Hookeri*, *Kütz. Phyc.* p. 375. *Sp. Alg.* p. 653.

PHLEBOTHAMNION *spinosum*, *Kütz. Sp. Alg.* p. 653.

CERAMIUM *Hookeri*, *Ag. Syn.* p. xxvii. *Hook. Fl. Scot.* part 2. p. 85. *Ag. Syst.* p. 138.

CONFERVA *Hookeri*, *Dillw. Conf.* t. 106.

HAB. On various Algæ between tide-marks, also on rocks near low water-mark, and at a greater depth. Annual. Summer. Dispersed along the British shores, from Orkney to Cornwall, and in Ireland; not uncommon.

GEOGR. DISTR. Atlantic shores of Europe: but rare.

DESCR. *Root* a minute disc. *Fronde*s densely tufted, one to four inches in length, and as much in expansion, having a conical or pyramidal outline, the lower branches being longest, the rest gradually shorter upwards, not perfectly distichous, and sometimes densely bushy, with branches turned in every direction. *Stem* mostly undivided, as thick as a hog's bristle, opaque and full of veins, or (in young specimens) obscurely marked with joints, closely set throughout with lateral, very patent branches, similar to the main stem.

These branches bear a second and third series; the lesser divisions being pinnated with alternate, ovate, patent, stipitate plumules. *Plumules* simply or doubly pinnate, the pinnules long and widely spreading, sometimes recurved. *Articulations* short in all parts where they are visible. *Tetraspores* numerous, spherical, lining the inner edge of the pinnules, one borne by every articulation. *Favellæ* binate, mostly terminal, on less regularly pinnate branches. *Colour* varying from a full purplish to a brownish red; sometimes pale pink, fading rapidly in fresh water to a dirty white. *Substance* flaccid, adhering to paper, and soon rotting if moistened after having been dried.

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A common but very variable species, and yet not difficult to understand when a few leading features are kept in view. Its most striking characters are the opaque stem and branches, the short articulations, and the very patent or divaricated ramuli, frequently pinnulated above. It verges on the one hand to *C. roseum*, and on the other to *C. Borreri* and to *C. polyspermum*, but is readily recognized from each of these by some one of its characters.

By the synonyms quoted, it will be seen that at one time I made *three* species of what I now regard as one: and if I had added a fourth (*C. affine*), I had perhaps acted discreetly—but I reserve that species for a future examination. Those who know the difficulty attending the determination of these plants, will best excuse these and similar mistakes.

*C. Hookeri* is named in honour of Sir Wm. J. Hooker, by whom it was first discovered, and communicated to Dillwyn as a new species.

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Fig. 1. *CALLITHAMNION HOOKERI*:—*the natural size*. 2. Base of a smaller branch, bearing three plumules. 3. Small branch with a favella. 4. Part of a plumule, bearing tetraspores. 5. A tetraspore:—*all more or less magnified*.

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